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Education for Industry.

IT is generally agreed that if the British Empire is to maintain its hitherto unrivalled industrial reputation, the supply of skilled men available for employment in its manufacturing undertakings must not be permitted to diminish; indeed, the demand for adequately trained *personnel*, especially in the electrical engineering industry, is likely to increase, and it is therefore essential that youth should be offered such opportunities as will avoid the too prevalent tendency to drift into "blind alley" occupations.

The Metropolitan-Vickers Electrical Co., Ltd., recognised this fact years ago, and its excellent system of works training, supervision, and welfare has become well known: under the control of its Education Department, two grades of apprentices are accepted, one training for artizan employment and the other course fitting them for ultimate professional employment. The latter group comprises youths from the higher secondary schools and young men from the universities and technical colleges. Many of them possess a surprising amount of knowledge when they enter the works, but is it always of the right kind they will need to apply in industry?

A student may be capable of designing a machine, but is he always quite so familiar with the practical considerations that govern and limit its size, type, and the means of controlling it? Teachers must make themselves acquainted with the latest works practice and the directions in which the development engineer is constantly endeavouring to improve and cheapen factory products. One method of doing so is outlined elsewhere in this issue, whilst another way of achieving the same object was tried last week in Manchester.

With the object of bringing together for their mutual benefit those who undertake the technical instruction of the young engineer and those responsible for his practical training and future employment, the Metro-

politan-Vickers Company organised at its Trafford Park Works a Summer School for Professors and Lecturers in Engineering, at which 18 universities and technical colleges in England, 6 in Scotland, 3 in Wales, 2 in Ireland, and 1 in Tasmania were represented. The venture was the first of its kind to be undertaken in this country, and when it is considered that the "school" had, of necessity, to be held in vacation time, the large number of people who notified their desire to attend (actually some 93 participated) is a striking indication of the welcome that was extended to the innovation.

It was a happy inspiration that caused the representatives of each university and college to be conducted round the works by ex-students of its own, the occasion being a splendid opportunity for those who are largely responsible for the technical training of young engineers, not only to refresh their knowledge of modern manufacturing methods and design, but also to acquire new ideas as to the type of men needed in manufacturing works and the paths along which educational establishments should direct their students, to fit them more adequately for their entry into industry.

Favoured with fine weather, the week's work can be counted to have been no less pleasant than instructive: fresh ideas must have been inspired, new resolutions formed, and the desire to rectify past shortcomings stimulated. Although the organisation of a Summer School is neither a light nor an inexpensive task, with the co-operation and goodwill of other large manufacturing organisations it might be made an annual event, to the benefit alike of "teacher" and "student," and the ultimate good of the industry as a whole.

Pulverised Fuel on Board Ship.

Some time ago we drew attention to the importance to the electrical industry of the experimental work that is being carried on in connection with the use of pulverised coal at sea. The extensive adoption of oil has hit our collieries very hard, substituting an imported commodity for our native product; if coal again comes into fashion, the prosperity of our mining industry will be at least partially restored, and the owners will be in a position to proceed with the electrification of their mines, thereby reducing the cost of production and affording employment to the electrical industries, as well as to the unemployed miners.

We note with interest, therefore, the complete success of the Blue Star Line's T.S.S. *Stuartstar*, which has made a round trip to South America with one of her Scotch-type boilers fired with pulverised fuel. A saving of £1,000 was effected, and the owners are so well satisfied that they are converting further boilers to the new system, and propose to apply it to their passenger liners.

An important point is that the existing boilers are convertible to pulverised-fuel firing, so that, once the economy of the system is established, it can rapidly be extended in the mercantile marine at moderate cost. We are pleased to see that the importance of this question was recognised in the discussion on Mr. H. E. Yarrow's paper at the B.A. meeting last week.

Electrical Salesmanship.

There are right and wrong ways of trying to sell electrical products, as there are in every other branch of trade activity. Practical experience teaches us which are the better ways yielding the best results. Some of the wrong ways were alluded to here in two leaderettes: "High Pressure Salesmanship" (Elec. Rev., August 31st); and "No Circulars, No Hawkers" (Elec. Rev., June 22nd). In the former we warned the trade against the danger of over-doing house-to-house visitation methods with their attendant importunity and annoyance to the householder—a class of salesmanship which we said had its spiritual home in the United States—and we mentioned recent evidence that had appeared of the growing unpopularity of such methods across the Atlantic. Finally, we expressed satisfaction that the American methods had "failed to obtain a foothold here." In our earlier leaderette, which was the outcome of personal experience, we criticised those who were trying to obtain that foothold here and were making themselves a nuisance. We said that the industry was unlikely to benefit permanently from the stream of house-to-house callers "who persisted in bothering householders at awkward times, and with unconscionable volubility, with offers of demonstrations of this or that device," which was always cheaper and better than any other, and "most frequently seemed to be of foreign origin." From our "Correspondence" columns to-day it will be seen that our remarks have either not been read before being criticised, or have been strangely misunderstood. How they can be construed as a "scathing indictment of British manufacturers" passes our comprehension. If, as we are informed, the British manufacturers deprecate such practices, we were actually fighting their battle against the importing concerns. In reply we wish to state that our comments stand unaltered, as do also the many other things that we have written urging the trade—all sections of it—to use the wisest, most enterprising and most adaptable means of bringing domestic electrical appliances before the public, but the advocacy of "*forceful* means" and "*forceful* methods" to convince the public of what is good for it, leaves us questioning. We are assured from important quarters that such appliances are selling like "hot cakes" at the present time. Let us increase the sales as rapidly as we can, and as one means of doing it let us court popularity with the public who will buy them, and not, as we said on June 22nd, "commit the error of . . . employing methods which place . . . employés on the same level as the importunate hawker of buttons and needles or packets of lavender." The expert demonstrator can render invaluable service, both in introducing business and in *keeping it*, by helping the user with her difficulties in "getting the best out of the machine" after an article has been bought. But that is another part of the subject. As we have said, there are right ways and wrong ways of approaching the public; one of the wrong ways we have criticised and we have shown that it is now becoming unpopular in the land of its birth.

The "Grid" and the Daily Press.

Last week the daily Press took occasion to "feature" with bold headlines the construction of the overhead transmission lines of the Central Electricity Board, foreshadowing the placing of contracts amounting to over a million sterling in connection with the London and S.E. Counties scheme, and announcing "the end of the first stage of the Government's project for the provision of cheap electrical power throughout Great Britain" on September 13th, as marked by "the completion of the first spans on the 18-mile section between Bonnybridge and Clydes Mill." The section will link up the systems of the Clyde Valley and Scottish Central-Electric Power Companies.

We note with regret, however, that the misleading announcements of "cheap electricity" are again appearing, emanating apparently from a common source; *The Times*, usually guarded, describes the Scottish scheme as "reducing the cost of power for all purposes to less than a penny per unit," and the *Daily Chronicle* even more definitely says "including domestic lighting and heating." Whilst the average cost of electrical energy for all purposes may in time be brought down to a penny per kWh, the public does not understand that, in general, the cost of production is the largest item in the selling price of electricity for domestic purposes, and the operations of the Board will not affect that item. It is a pity that this misleading cry of "cheap electricity" is still current. Mr. Archibald Page, referring to "electricity for all purposes at a penny per unit," described the statement as a "myth" (Elec. Rev., November 11th, 1927.)

A Diesel-Electric Ship.

The new 17,680-ton oil tanker "Brunswick" is the first vessel built on the Clyde for propulsion by Diesel-electric machinery.

In our issue of September 7th, p. 407, we gave some brief particulars of the Diesel-electric equipment of the new oil tanker *Brunswick*, built by Messrs. Scott's Shipbuilding & Engineering Co., Ltd., for the Atlantic Refining Co., Philadelphia, which has just successfully passed her trials on the Clyde. We are now able to describe the ship and her equipment more fully.

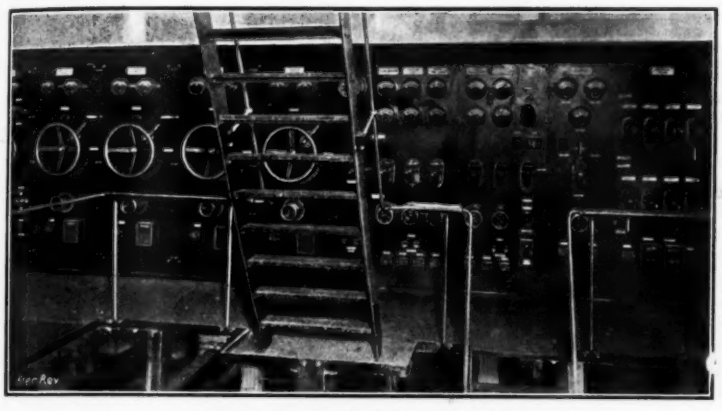


Fig. 1.—Main Switchboard Controlling all the Electrical Equipment on the Ship.

The new vessel, which has a maximum displacement of 17,680 tons, is 470 ft. long, 63 ft. wide, and 37 ft. deep. Her deadweight is 12,500 tons.

600-kW generator supplying d.c. for propulsion purposes at 250 volts. Each engine also drives a 75-kW, 250-V auxiliary generator, arranged in tandem with the main generator, for supplying power for the ship's auxiliaries and also for the excitation of the main generators and the propelling motor. The main generators are electrically coupled in series, and although all four are in operation at full load, three, two or only one set may be used for reduced loadings, the supply voltages being 1,000, 750, 500 or 250, according to the number of sets in operation. The main propelling motor, fig. 2, 2,800 h.p., consists of two units, each complete with a separate magnet frame, armature and commutator; the two armatures are electrically connected in series and mounted on a common shaft supported between two pedestal bearings. It is possible to develop sufficient power for about three-quarter speed with only one-half of the motor in commission. Starting, stopping and reversing of the propeller motor are effected entirely by varying the excitation of the main generator or generators. The control arrangements are such that the main propelling circuits are never interrupted, but provision, however, is made for isolating any of the generating units as may be desired. The control is carried out by means of a lever attached to a small controller fixed to the front of a sheet-steel panel carrying the necessary instruments, this lever being moved by the operator to either side of a central stop point, so that when

Fig. 2.—Main Propeller Motor; 2,800 b.h.p. at 95 r.p.m.

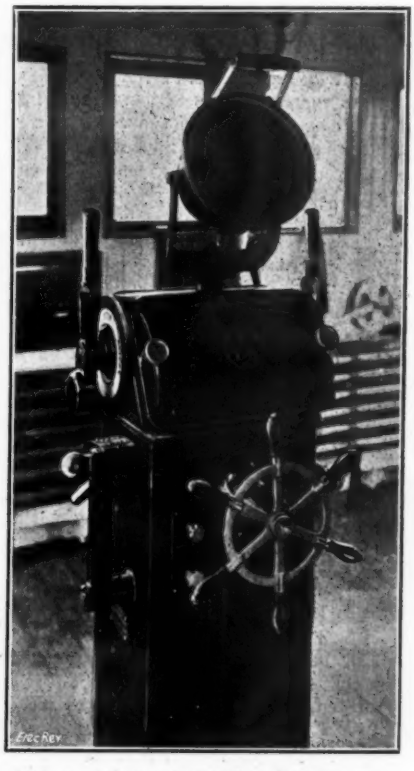


Fig. 3.—Master Controller, "Sperry" Gyro Compass, and Steering Wheel.

Four generating sets, fig 4, are arranged in an engine room aft, each consisting of a six-cylinder Ingersoll-Rand Diesel engine, 225 r.p.m., directly-coupled to a

manœuvring all that has to be done is to move the lever on to the speed point required, either ahead or astern. The actual varying of the propelling generator fields during manœuvring is effected by means of a reversing potentiometer rheostat common to each generator field circuit, the rheostat being operated through gearing by a small electric motor. Movement of the control lever merely switches this small motor into circuit, and, by means of follow-up gear, the motor switches itself out and stops when it has moved the field rheostat to a position where a field strength is obtained on the generators corresponding to the speed point where the lever is at rest on the controller. The rate at which the potentiometer rheostat increases the voltage on the generators is such that under normal conditions the power required to accelerate the ship does not exceed the full-load capacity of the engines. This is taken care of automatically by the follow-up gear, regardless of the rate at which the controller on the bridge is operated. There is also a special type of overload current relay in the main circuit. Fig. 3 shows the master controller, "Sperry" gyro compass pedestal, meter panel and steering wheel.

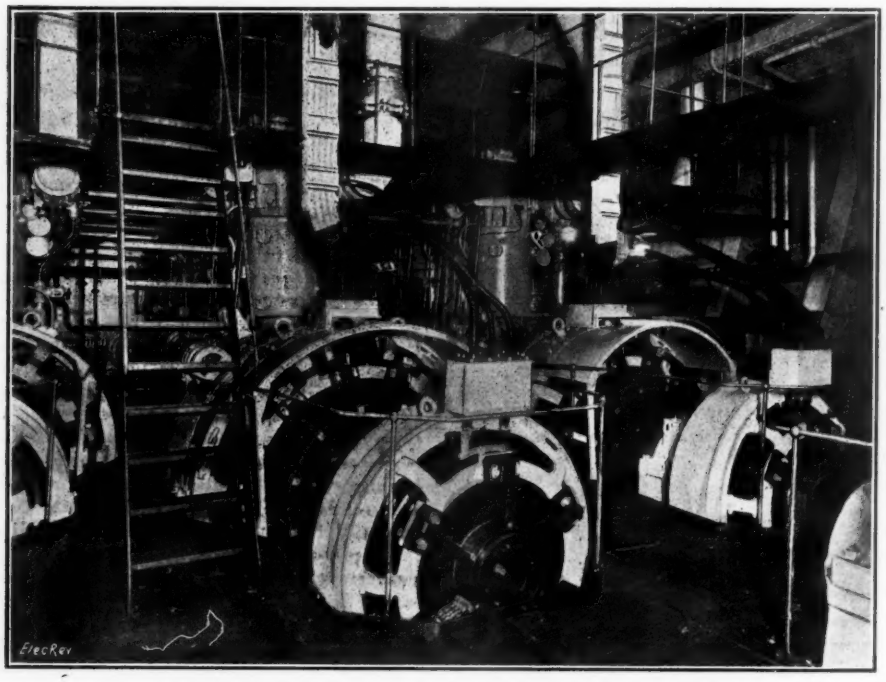


Fig. 4.—Main and Auxiliary Diesel-driven Generators.

Main circuit breakers are not provided in the propelling circuit, as it is considered preferable to leave the stressing of the equipment under abnormal conditions entirely to the discretion of the engineer on watch. In this connection it should be borne in mind that the motor is equal in capacity to the generating plant and is not so liable to prolonged overloads.

Normally the propelling system, at the point between the two motor armatures, is connected through a circuit breaker and current-limiting resistance to the ship's structure, but should an accidental earth occur on any part of the main circuit sufficient to open this circuit breaker, a loud ringing bell in the engine-room would give warning. In order to facilitate the putting in or taking out of any of the generating sets, arrangements are made for the operator at the control panel to be able to transfer the excitation supply from one machine to another without leaving his post. Suitable interlocking gear between the main generators provides against careless switching, and provision is made for any one of the propelling generators to be used for the auxiliary load. In the event of failure of the excitation supply voltage the main potentiometer rheostat returns automatically to the "stop" point, recloses the field contactors, resets the overload relay (if tripped) and returns automatically to the previous setting, according to the position of the bridge controller, as soon as the supply is resumed. To provide against such a contingency as failure of the small rheostat motor when the vessel is being manœuvred in narrow waters, a handwheel mounted on the motor panel enables the potentiometer rheostat to be manually operated. This handwheel is normally disengaged from the rheostat operating shaft, but is always ready for instant engagement should the propeller speed fail to respond to a movement of the control lever; when engaged it automatically cuts the small rheostat motor out of circuit. The control lever is so arranged as to allow a complete full-power reversal to be carried out in about 8 seconds—the handwheel is geared so that it can be operated through a similar reversal in about 30 seconds.

When bringing the propeller to rest, prior to a reversal in its direction of rotation, the action of the water causes the propeller to keep rotating in a forward direction and so to drive the propeller motor as a generator; the energy generated is dissipated in "motoring" the propelling generators. These in turn partially or entirely supply the power for rotating the engines and auxiliary generators, and, owing to the considerable amount of power required to overcome the friction load of a Diesel engine at full speed, about 33 per cent. of its normal output, this forms a very convenient means of dissipating the braking energy.

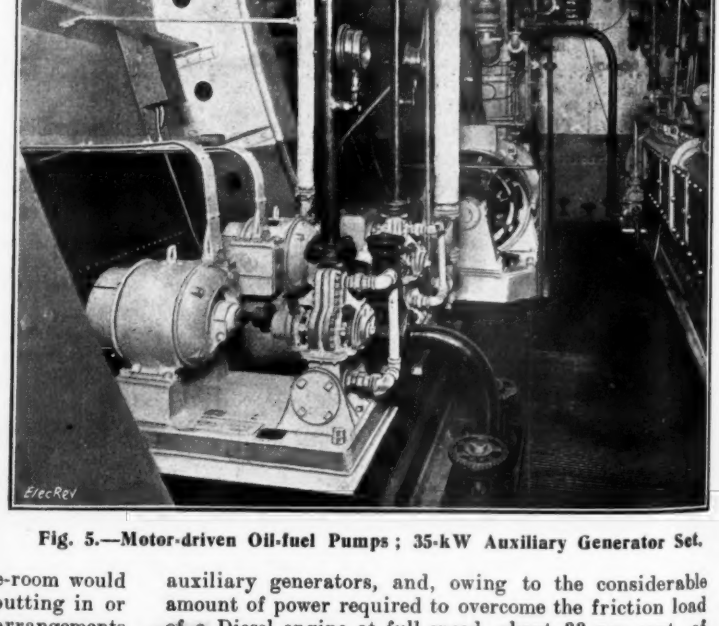


Fig. 5.—Motor-driven Oil-fuel Pumps; 35-kW Auxiliary Generator Set.

A feature of the electrical installation is the main

switchboard, fig. 1, which has an overall length of 30 ft. and consists of 11 panels, 1 propeller-motor control panel, 4 generator panels, 4 exciter panels, 1 balancer panel, and 1 distribution panel for the auxiliary circuits. The generator panels each have "set-up" switches which can be mechanically operated from the front of the board; all the "live" parts are at the back. The "set-up" switches are arranged to give three positions, namely, "off," "propulsion circuit," and "main power busbars." The exciter panels are also of the "dead" front type. The exciter switches are mechanically interlocked to prevent paralleling of the exciters (each auxiliary machine supplies an independent circuit), and electrically interlocked to prevent the paralleling of an exciter with the main generators. The balancer panel, also "dead" front, is arranged so as to permit operation of the balancer from either the exciter circuit or from the auxiliary-generator circuit. The design of the distribution panel is such that it is possible to supply all the auxiliaries from either the exciter busbars or the main power busbars. Complete metering equipments are provided on all the panels, and the switchboard is equipped with earth-detector voltmeters and lights.

Current-detection apparatus is connected for each set of busbars, and for each generator, motor, excitation and balancer circuit, and so on. Three sets of busbars, "excitation," "auxiliary," and "main power," are provided for auxiliary purposes, and interlocks prevent more than one generator at a time being connected to the same set of busbars.

The main generator "set-up" switches are mechanically interlocked to prevent "live switching"; a lever which takes the field off a generator must be moved to the "off" position before the main switch can operate. The "set-up" switches are also mechanically interlocked to prevent more than one generator at a time being connected to the "main power" busbars. A busbar connecting switch joins the "auxiliary" and "excitation" busbars when only one engine is running. Mechanical interlocks prevent any other exciter being coupled to the auxiliary busbars when this switch is closed. The exciter switches are interlocked to prevent more than one at a time being closed on to the same busbars.

The potential relays for the trip-out contactors in the field circuits of the main generators when the latter are on "propulsion," so as to prevent the remaining generators from "motoring" an engine in the reverse direction, should the engine cease to develop power, are energised from the exciters.

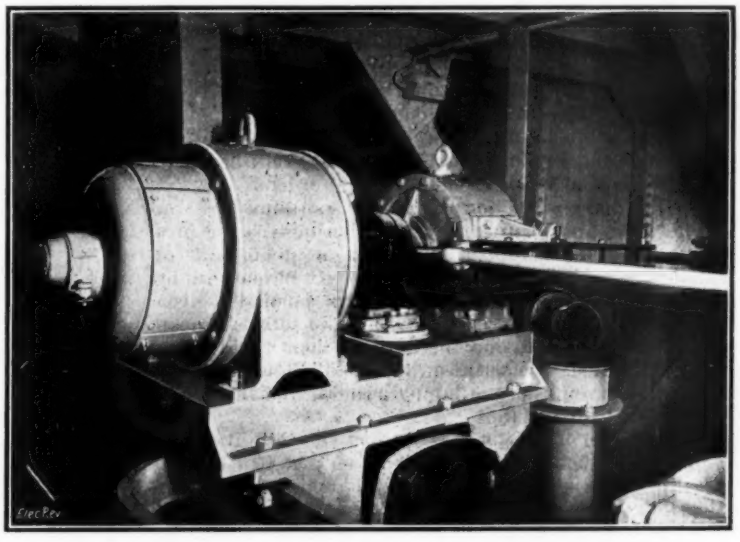


Fig. 6.—15-h.p. Motor driving "Hastie" Hydraulic Steering Gear.

Electric driving is employed extensively for the ships' auxiliary equipment. All the engine-room auxiliaries and deck machinery, including pumps, fans, compressors, winches, and so on, are electrically driven. The total horse-power of the auxiliary motors is 550, and these motors range in size from 1 to 80 h.p. All the motor starters are mounted on two auxiliary panels. 250 V is used for the power circuit, and 125 V for lighting, the latter being taken from a balancer set. Fig. 5 shows two motor-driven oil-feed pumps, and also a 35-kW auxiliary set. Fig. 6 is a view of the "Hastie" hydraulic steering gear, driven by a 15-h.p. motor.

Stock Control for the Electrician.

Showing How Stock Control Increases Turnover.

(Communicated.)

It sometimes surprises me how some retail shops carry on, for it is quite a common thing to go into some shops and ask for one or two different things and get the answer from the assistant: "Very sorry, but we are out of stock." In some cases the retailer will endeavour to oblige his customer by sending out for the article required, but in nine cases out of every ten it will be found that the customer is in a hurry and is unable to wait. It must be remembered that every time you are out of stock of a line, you have missed a sale, and in these days of keen retail competition no retailer can afford to be out of stock of any of the lines which he holds himself out to carry.

When one considers that it is a smart shop front and an attractive window display, combined with good advertising, that bring people into your shop, it seems both a pity and a waste of good money when customers have to be turned away because you are out of stock of certain goods which you hold yourself out to sell.

Some retailers may say that it is quite impossible to have every line in stock always, while others would say that it was not impossible but the work entailed would be too great. This article is written so as to give some simple methods of stock-keeping, which may be adapted by the large store with various departments, or by the small retailer, according to their requirements.

The system—if it can be called a system—of some shopkeepers is to mark down on a "wanted list" the names of certain commodities as soon as they find they are "running low" or are out of stock. But the best of us can forget to mark down the goods that are required under certain circumstances. It may be that a customer comes into your shop and asks the assistant for a certain thing which he finds is out of stock; he

then makes a mental note of it, and intends to transfer it to the "wanted list" as soon as he has time. Just then another customer claims his attention, and by the time he has finished serving this customer he has forgotten all about the article which was out of stock.

In some cases it will be found that the shopkeeper won't trouble to re-order until the traveller comes again. In the ordinary course the assistant reports that some line is not in stock, and the proprietor waits for the traveller to call when he can give him the order. If the proprietor knew how many times he was asked for this particular line between the time he was actually out of stock and the time of arrival of the goods, he would no doubt change his method of giving orders.

It is not always possible to get assistants to be as interested in the progress of the business as the proprietor, and some assistants show a great lack of interest in their work. If staffs were encouraged by the receipt of a bonus on sales or by a commission given on certain lines, they would soon cease to work in an automatic manner, and the business man would profit by the change. Dissatisfied, underpaid and overworked assistants are of no use to any business, and the sooner this is noted the better.

Since the proprietor has to foot the bill, it is up to him to control his business and see that if a certain selling line is out of stock, it is replenished at the earliest opportunity.

The longer you are out of stock of selling lines, the more your turnover and profits are reduced. In addition to this, you must remember that you are probably losing customers whom you will never get back.

System of Replenishment.

A good method to adopt in order that you may be able to say in nearly every case: "Yes, sir," or "Yes, madam, we have it," is as follows:—

(1) When it is found that the stock of a certain commodity needs re-ordering, leave out a duplicate of the particular line required. This should be placed on the order desk (of the buyer), and should not be returned to stock until the order has been actually made out and posted.

(2) Each counter should have a "wanted list," which should be placed in a prominent position behind the counter, and as soon as it is found that the stock of a certain line is running low, it should be placed on this list. There should be no such thing as "marking down when you get time"; such a method as this is too unreliable and inefficient, and in view of the fact that none of us are in business for the good of our health, we want to be as reliable and efficient as it is possible for us to be.

Let each assistant responsible for his particular section take a note-book round towards evening, and go through the stock systematically, noting lines that need to be re-ordered. It is not a long job when done each night, and if combined with the "wanted list" it works quite well, since it is a double check upon forgetfulness. It goes without saying that the stock must be well arranged so that the task of the assistant who "runs over" it may be simplified.

The Card System.

Many retail shops have their stock, in the stock room, kept upon the card index system. By the use of this system it is possible to ascertain how much of a certain line you should have without actually taking stock.

The cards are kept in small cabinets, and it will often be found that one small cabinet will be sufficient for the keeping of the stock of one stock room. The popular size of these cards is 5 inches by 4 inches, and on the left-hand side of the card are recorded all the goods which have been received into stock, while on the right-hand side is recorded all the stock which has been issued to the shop or elsewhere. Where there is more than one shop it is possible to transfer certain stock from one shop to another, and *vice versa*.

A simple ruling of these cards is as follows:—

STOCK CARD.

Minimum quantity			Cost price		Sale price			
Stock received					Stock issued			
Date	From whom received	Address	Quantity	Amount	Date	To whom issued	Assistant's name	Amount

By ascertaining the quantity of stock issued and deducting it from the total stock received, the balance will represent the amount of stock you should have on hand. Such a system as this is very useful where certain stock requires a lot of counting and checking in order to obtain the value or quantity on hand.

Where the card system is used, a separate card is kept for each commodity stocked. These cards can be ruled to meet the requirements of any business, and they are very useful in that they are able to tell you what stock you ought to have of any particular line, without taking stock, for all "stock received" and "stock issued" will have been accounted for. This is rather useful information where, under the old method you would have to turn out a drawer containing, say, 200 of a certain line and count them before you could obtain your stock figure.

It does not follow that the quantities and values as shown by these cards should be accepted for the annual stock-taking, and it will be better if stock is actually taken once a year and compared with the stock cards in order to see if the two figures agree. By this means you will be able to see if the stock as shown by these cards is actually there, and if not, then you will want to know how this deficiency has been brought about. From this it will be seen that the keeping of proper stock records is also a check against theft.

In some stores these cards used for stock-keeping also give the position of the stock in the stock room. For example, the stock room may have fixtures all round, and in addition rows of fixtures can be placed down the centre of the room. Each shelf of every fixture will be given a number, and this will correspond with the number on the stock card. The stock cards will in most cases be kept in alphabetical order, and if an assistant wants to know where to find a certain thing, all he has to do is to go to the card index, look up the letter under which it is placed, and take out the card. From this he will be able to go right to the shelf and find the stock he requires.

The writing and keeping of these stock cards does not take up much time, and this class of work can be handled by a young assistant who is a fairly good writer. It is well to remember that the best recording system is useless unless kept right up to date, and it is the custom to engage someone who has had a little experience in this work and make him responsible for the keeping of the records. This saves a good deal of time and secures attention being devoted to the work.

The Midland Electrical Engineers' Ball.

The committee has again decided to hold the Midland Electrical Engineers' Ball, at the Grosvenor Suite, Grand Hotel, Birmingham, on Friday, November 16th. Mr. R. A. Chattock is president; Mr. W. H. Heaton, of the General Electric Co., Ltd., Witton, is chairman, and Mr W. Y. Anderson, 14, Dale End, Birmingham, is the hon. secretary. It will be remembered that as a result of last year's ball the Committee handed to the Institution of Electrical Engineers' Benevolent Fund the sum of 75 guineas.

Overhead Line Design.

The author bases line calculations on his claim that, within limits, for standard wood poles, the maximum perm ssible force at a point 2 ft. from the pole top is constant and independent of the pole height.

By J. A. SUMNER.

THE subject of overhead lines is one that has been dealt with fairly fully in the technical Press, both from the strictly practical and the theoretical sides, and some excuse would seem to be required for a further article on the subject. There have been, however, very few articles dealing with pole-line design purely from the view of the supply engineer, who is now commencing overhead work, for distribution and secondary transmission, with no former experience to rely upon. Overhead work is often regarded as a necessary and modern evil, which will have to be adopted sooner or later, owing to the incidence of an insistent (and often coercive) demand for supply, and many engineers are still avoiding it because of the lack of any simple methods of arriving at the correct data. The problem is dealt with from the point of view of those engineers who will require to design pole lines chiefly for low-pressure and secondary distribution, without the help of outside contractors. Distribution lines are most satisfactorily dealt with by the use of wood poles as supports, and it may be that the following examination into the correlation of the variables will prove useful. The writer hopes that his contribution towards the solution of the problem of the direct design of the line giving the most economic design results without "trial and error" will be criticised by all those interested, so that its accuracy may be established, if, indeed, it so deserves.

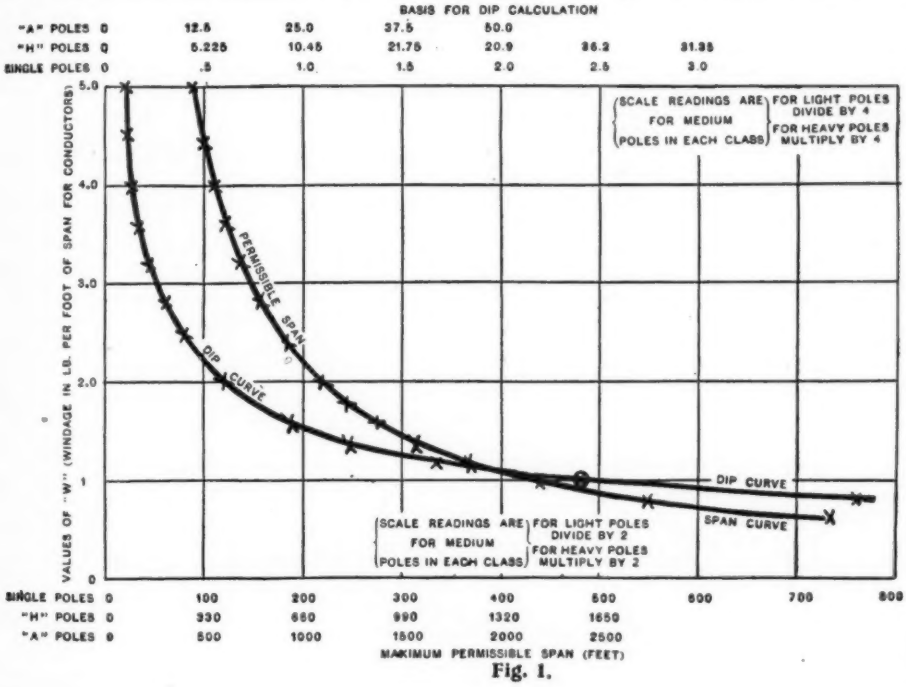

BASIS FOR DIP CALCULATION
"A" POLES 0 12.5 25.0 37.5 50.0
"H" POLES 0 5.225 10.45 21.75 20.9 26.2 31.35
SINGLE POLES 0 .5 1.0 1.5 2.0 2.5 3.0
VALUES OF "W" (WINDAGE IN LB. PER FOOT OF SPAN FOR CONDUCTORS)
5.0
4.0
3.0
2.0
1
0
SCALE READINGS ARE FOR MEDIUM POLES IN EACH CLASS
FOR LIGHT POLES DIVIDE BY 4
FOR HEAVY POLES MULTIPLY BY 4
PERMISSIBLE SPAN
DIP CURVE
DIP CURVE
SPAN CURVE
SCALE READINGS ARE FOR MEDIUM POLES IN EACH CLASS
FOR LIGHT POLES DIVIDE BY 2
FOR HEAVY POLES MULTIPLY BY 2
SINGLE POLES 0 100 200 300 400 500 600 700 800
"H" POLES 0 330 660 990 1320 1650
"A" POLES 0 500 1000 1500 2000 2500
MAXIMUM PERMISSIBLE SPAN (FEET)

Fig. 1.

NOTATION.

w = Windage per foot run of wire (for worst conditions) in lb. per ft.

s = Maximum permissible tension in conductor = breaking load ÷ factor of safety.

r = Resultant of weight of and windage on ice-covered conductor (gale conditions).

r/s = Physical constant for a given wire.

L = Span length.

F = Maximum permissible force which may be applied at a point 2 ft. from pole top (after deducting windage on pole itself).

W = Windage per foot run of conductor totalled for all conductors attached to pole = $w_1+w_2+w_3 \cdots w_n$, &c.

n = Number of conductors.

N = Number of poles per mile of line.

M = Cost of poles per mile of line.

The essential variables to be considered are those of span length, pole diameter, pole height and the force exerted on the pole due to wind pressure on the wires. These factors have previously been considered as not being capable of correlation, and the process of determining the correct pole size has therefore been laborious; in fact, it may be said that the economic stress line is rarely hit upon by the designer. The usual method adopted is a selective one consisting of:—

(*a*) The calculation of windage on the conductors and the consequent force exerted on the pole.

(*b*) To calculate this force for a hypothetical span with a further hypothetical pole height.

(*c*) To calculate the resultant bending moment at 1 ft. from the ground.

(*d*) This resultant bending moment must then be compared with the maximum permissible bending moment corresponding to the diameter of pole of height chosen in (*b*) above, and a series of hypothetical installations must be worked out until approximate coincidence is obtained between (*c*) and (*d*), unless, indeed, the designer's patience gives out before the "best line" is discovered. It will be seen that unless there is considerable experience and knowledge of the span which will give results, *i.e.*, maximum stress in the parts, the method is laborious and, to say the least, adventitious. Owing to the infinite number of combinations of the variables, it has not been considered possible to present a general case, although the method given in the handbook issued by The British Insulated Cables, Ltd., utilises a tabular arrangement of the relations between the pole height and diameter, and consists of a comparison between the maximum permissible and the calculated bending moments for a given pole. Unfortunately it is still necessary to calculate for each of a number of spans. A method suggested by the author which it is believed will simplify calculations is given later.

The ideal requirements for the most economic design from the point of stress in the parts may be stated as follows, for a given pole:—

(1) *Span.*—The span length shall be such that the

force exerted at the pole by the wind acting on all the attached wires in the span at a height to comply with (2) shall produce a bending moment at the ground exactly equal to the maximum permissible bending moment.

(2) *Pole Height and Diameter.*—The pole height shall be such that the ground clearance from the lowest conductor shall be just the regulation clearance when the conductor sag is such as to give just the maximum permissible tension in the conductor. The related diameter shall then have a bending moment corresponding to the b.m. produced in (1) above.

(3) *Conductor Sag and Stress.*—The tension in the conductor when sagged so as to conform to (2) shall be the maximum permissible tension.

(3*a*) The pole height shall also conform to the requirement that, when its value is such as to conform to condition (3), its related diameter will be equal to that required in condition (1).

(3*b*) Under maximum stress conditions all these conditions must occur simultaneously.

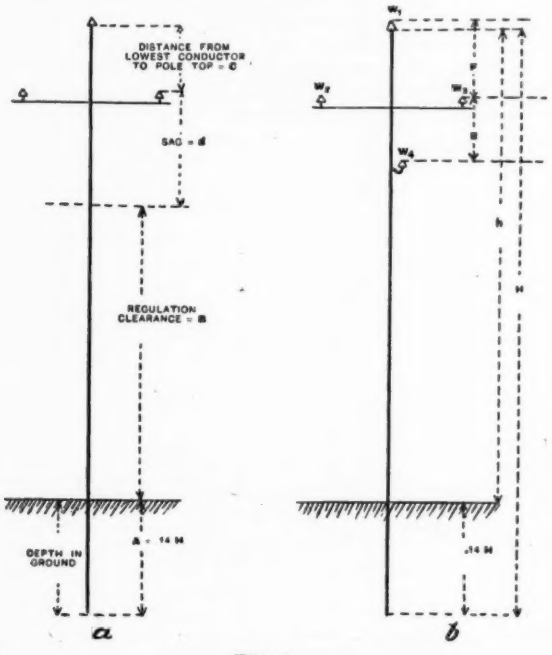


Fig. 2.

These ideal requirements are inherent in the following method so far as the stresses in the pole and the conductor are concerned.

Consideration of Standard Wood Poles.—The supports used in British wood pole line practice are detailed in the British Standard Specification No. 127—1921, and were the result of recommendations made by the Post Office some years ago. The standard poles are divided into *three groups, viz.*, light, medium and heavy poles, with heights ranging from 18 to 50 ft. for the first group, 24 to 85 ft. for the second, and 26 to 85 ft. for the third group. A pole, to comply with the specification, must have a definite relation between height and diameter at three points along its length. For the purpose of this article the range of available wooden supports has been divided into three *types*: single A, and H poles, the last mentioned types, A and H, consisting of two single poles scarfed or tied together and having suitable bracing and tensioning members. Each type can therefore again be divided into three similar *groups*, giving nine *classes* in all.

Consideration of Economic Design.—The relevant requirements are given in the following extract from the Overhead Line Regulations El.C.53b, as recently revised and issued by the Electricity Commissioners:—

"The factor of safety for wooden supports shall be 3.5, and shall be calculated on the assumption that all line conductors, cables and wires carried by the supports are at a temperature of 22 deg. F., and have a covering of ice to the radial thickness specified in Regulation 12 (or 15), and that, together with the supports, they are subjected to a wind of 50 m.p.h. at right angles to the line, this wind to be taken as exerting a pressure of 8 lb. per sq. ft. calculated on the whole of the projected area."

The windage will be exerted on both the pole and wires, and if the windage on the pole be deducted, the permissible bending moment will be reduced. This bending moment is calculated for a modulus of rupture of 7,800 lb. per sq. in., which is the modulus approved by the Electricity Commissioners. When deducing this revised bending moment, it must be noted that allowance must be made for the factor of safety of 3.5. The writer claims to have discovered an important fact which is the basis of the subsequent method and calculations: Assume the poles to be placed at a depth in the ground sufficient to give resistance against overturning for average ground. It is claimed that, within limits, for any standard pole of a given class, the relation between the pole height, diameter at the ground and the bending moment is such that *the maximum permissible force which may be applied at right angles at a point 2 ft. from the pole top is constant and independent of the pole height.* The limits are those of 26 ft. minimum and 45 ft. maximum height, which covers the normal range of poles for general use. The importance of this fact is that the variables of pole height and diameter are eliminated in any calculations of pole stress.

Let "*w*" lb. be the windage per foot of wire under the regulation conditions, and the total windage of all the wires attached to the pole be stated as "w" lb., where $w = w_1 + w_2 + \ldots . w_n$ (or "*nw*" where the wires are all of the same cross section); then the force exerted at the pole top will be "$w \times L$" (where L is the span in feet). If, therefore, this value be made equal to the constant maximum permissible force for each pole of a given class, the pole will be under its maximum stress, or, alternatively, since $w = k/L$ (where k is a constant for a given class of pole), then $L = k/w$. "L" is then the span for which there will be maximum stress in the pole.

In any problem the number and diameter of the conductors and associated wires will be known, and "w" may then be immediately evaluated. Then, for any given wire or combination of wires, a value of span length may be obtained which is independent of the pole height and is *the only value of span* which may be used to give maximum stress conditions for that class of pole, and the first condition (previously stated) for economic design is satisfied. This assumes that for any arrangement and combination of wires the average height at which the force acts is a point 2 ft. from the top. For most arrangements this assumption will not introduce great error, but, as a safeguard, the value of "*k*" may be varied.

It now remains to determine the pole height. We have (see fig. 2*a*) the specified ground clearance + the sag of the thinnest conductor for the desired span, under the worst conditions, + the distance from the point of attachment of the lowest wire to the pole top, giving us the height of pole required above ground = "*h*," say. Then if the depth in ground is .14 H, we may say that $h = .86$ H, and the overall height may be at once obtained.

The regulation El.C.53 states that "the height from the ground of any conductor at any point in the span *at* 122° *F.* . . . . &c.," *i.e.*, the dip shall be calculated on a temperature basis, whereas it will be noted that the dip throughout the paper has been based on the assumption of ice and gale conditions. Actually there is very little difference for the dips required for the respective bases, except for very short spans and large cross-sections, and the use of the dip for gale and ice conditions enables the maximum conductor tension to be introduced.

Under the above conditions of sag the tension in the wire will then be the maximum permissible ten-

sion, and the remaining conditions required for maximum stress in all the parts will have been fulfilled. It will be noted that the pole height to give the required sag is automatically the economical (stress) pole height, and the ideal conditions for sag and tension are satisfied.

An advantage of this method of calculation is that the assumption previously made is general, and whilst not fulfilling the requirements of a law, it is general for all standard poles, within limits, and may therefore be presented graphically. The values of the constant force which may be applied to any pole of a given class are given in the following table, from which it will be seen that the ratios of strength between the classes of each type of pole are constant.

Type of pole ...	Single			"H"			"A"		
Class	L.	M.	H.	L.	M.	H.	L.	M.	H.
Max. permissible force in lb. at pole top ...	220	440	880	720	1440	2880	1100	2200	4400
Ratio between classes ...	1	2	4	1	2	4	1	2	4
Ratio between groups ...		1		3.3			5.0		

We may therefore summarise the matter as follows for purposes of design. The possible line formations and combinations of conductor sizes for a given type of transmission are variable within very wide limits. Each combination, when multiplied by the span length, will, however, have a definite wind resistance, and will therefore exert a definite force at some resultant point near the pole top, the product of which force with the height above ground at which it acts will produce a bending moment on the pole at 1 ft. from the ground. Since, for standard poles, for a given height (ex ground), there is one related diameter and, consequently, only one maximum permissible bending moment, it has previously been necessary for the variables of windage, span and pole height to be given differing values *for each pole of each class of poles* until a certain relation gives a bending moment which coincides with the bending moment for *a particular pole.*

The previous hypothesis may be stated to mean that for *any* combination of wires, whose windage will, of course, be known, there is a corresponding particular span length *which is general to all poles of a given class of poles*, and therefore the variables of pole height and diameter may be ignored, within limits, for pole stress design purposes, and the pole height which just complies with the requirements for the components of sag and clearance is *the* pole in the group which gives maximum economy in stress.

Graphical Representation.—For most normal combinations of wires for overhead transmission the limits of the combined windage per foot run of all wires in the span will be between 0.5 and 5.0 lb. per foot of span. Similarly, economic (cost) considerations prohibit a span length greater than approximately 750 ft. when using wood supports. The curve of $L = k/w$ may therefore be drawn within these limits. Since the relation between height and diameter is constant for all groups and types of poles, a basic curve may be drawn, and the scales of permissible span, differing for each group, may be related to this one curve.

The curve is shown in fig. 1, and a table of windages per foot run of conductor for various conductors is given in Table II, so that it may be referred to in the examples given later.

TABLE II.

H.D. copper wire. Particulars.			Windage per conductor on ice covered conductor to a radial thickness of $\frac{3}{16}$".	Windage per conductor on ice-covered conductor to a rad'l thickness of $\frac{1}{4}$".	Multipliers for dip = $r/s \times 10{,}000$.	
Wire.	Inches Diam.	Nominal Area.	·375" ice.	·75" ice.	·75" ice.	·75" ice.
8 s.w.g.	·16	·0201	·357	·607	6·32	11·15
6 s.w.g.	·192	·0289	·3·8	·628	4·94	7·1
3 s.w.g.	·252	·0498	·418	·668	3·56	5·74
3/·147	·317	·05	·462	·712	3·85	6·06
3/·180	·388	·075	·509	759	3·15	4·72
7/·136	4·8	·10	·522	·772	2·5	3·7
7/·166	·498	·15	·582	·832	2·23	3·055
7/11 s w.g.	24	035	·410	·6	—	—
7/12 s.w.g.	·312	·058	·458	·708	—	—
7/8 s.w g	·48	138	·570	·82	—	—

Two extreme examples will be given, utilising two methods for determining the pole size. The spacing and clearances for each example are referred to those given in symbols for the pole outlined in fig. 2 (*b*).

(To be continued.)

The International Illumination Congress.—I.

An Account of the Tour in the United States, and the World Congress at Saranac.

(By OUR OWN CORRESPONDENTS.)

THE first World Congress on Illumination, which is being held in America during the month of September, is an outcome of an invitation which was extended by the United States National Illumination Committee to the International Commission on Illumination to hold a plenary meeting at Saranac, N.Y. The I.C.I. was founded in 1900 under the title of the International Photometric Commission, which was itself the outcome of a resolution passed at a congress of members of the gas industry held in Paris on the occasion of the Paris Exhibition of 1900. At this congress it was recognised that it was to the general and common interest of consumers and manufacturers to have definite information regarding the illuminating power of light sources, and to endeavour to find a basis for establishing international standards. For this purpose national committees were set up in Austria, Belgium, France, Germany, Great Britain, Holland, Italy, Switzerland, and the United States of America, and the association of these countries formed the International Photometric Commission. Meetings were held at Zurich in 1903 and 1907, at which much progress in fundamental standards was made. As a result of a resolution from Great Britain passed at the Turin Electrotechnical Congress in 1911, and the subsequent action of the American Gas Institution in proposing the extension of the Photometric Commission, it was decided to widen its scope and constitution so as to include the electrical interests, and at Berlin in 1913 a new basis was agreed upon, so that important matters concerning the application of light sources could be included in the work of the Commission. Meetings subsequently held in 1921 at Paris and 1924 at Geneva resulted in definite standards being established, and the meeting held at Bellagio last year cleared the ground for the important plenary meeting which is about to be held. As might

be expected from such a vigorous and hospitable nation as the United States, an opportunity such as this would not be allowed to pass without making special arrangements to show the foreign visitors the remarkable progress which has been made in the scientific and practical aspects of artificial illumination in all its branches, and the lighting men of America with characteristic energy got together to organise a programme such as the world has never known before. Under the chairmanship of Mr. Julius Daniels, of the Boston Power Company, an executive committee was formed, which in turn set up a number of sub-committees each under the direction of an eminent engineer, to make arrangements for entertaining and instructing the Commission delegates.

The Illumination Congress is divided into three distinct sections: first, there has been during the past weeks a tour of the principal cities in the eastern and middle-western cities, where an inspection has been made of the technical, practical, and commercial activities which are being conducted by the various authorities engaged in the perfecting and development of lighting. Arrangements have also been made to inspect some of the outstanding lighting installations of which America is so justly proud. Following the tour the foreign delegates are meeting the members of the American Illuminating Society at their annual convention at Toronto. A special programme of an international character has been arranged, and several of the foreign delegates are reading papers. Finally the party will move on to Saranac, where the I.C.I. will assemble on September 22nd. The British delegation sailed from Southampton on Saturday, August 25th, on the s.s. *Tuscania*, and consisted of the following gentlemen:—

Mr. Clifford C. Paterson	(President, International Commission on Illumination.)
Dr. J. W. T. Walsh ...	(General Secretary, International Commission on Illumination.)
Mr. C. P. Banham ...	(B.T.-H. Co.)
Major J. W. Buckley ...	(Metropolitan-Vickers Co.)
Mr. W. E. Bush	(E.L.M.A.)
Mr. J. F. Colquhoun ...	(Sheffield Corporation.)
Mr. P. Good	(B.E.S.A.) representing the I.E.E.
Dr. W. M. Hampton ...	(Chance Bros.)
Mr. J. M. Henshaw ...	(B.T.-H. Co.)
Mr. L. B. W. Jolley ...	(G.E.C. Labs.)
Prof. J. T. Macgregor Morris	(East London College) representing the I.E.E.
Mr. J. W. Ryde	(G.E.C. Labs.)
Major G. H. Spittle ...	(Railway Clearing House.)
Mr. E. J. Stewart ...	(Glasgow Corporation.)
Mr. C. W. Sully	(E.L.M.A.)
Mr. J. R. Thomas ...	(Edison Swan Co.)
Dr. R. Unwin	(Ministry of Health.)
Mr. J. M. Waldram ...	(Waldram & Son.)
Mr. R. Watson	(Inst. Gas Engineers.)
Mr. G. Wilson	(G.E.C. Labs.)

Lt.-Col. K. Edgcumbe, chairman of the British National Committee, was unable to join the delegation owing to important engagements at home, and Mr. R. Watson was appointed to lead the British group in his absence. Mr. Watson was unfortunately unable to sail on the *Tuscania*, and Mr. Good acted as deputy leader on board the ship. Special arrangements made at very short notice by the Cunard Company made it possible for the French delegation to join our boat at Le Havre, and their party consisted of the following:—

(*Chairman*)	
Prof. L. P. C. James Chappuis	(Ecole Centrale des Arts et Manufactures.)
(*Vice-chairman*)	
M. J. F. Cellerier ...	(Conservatoire des Arts et Metiers.)
Mademoiselle Bloin ...	(Secy. to M. Chappuis.)
Prof. J. J. Blondin ...	(Revue Générale de l'Electricité.)
M. C. M. Exelmans ...	(Holophane Co., Paris.)
M. A. A. Gouffé	(Société du Gaz de Paris.)
Prof. R. A. Jouaust ...	(Laboratoire Central de l'Electricité, Paris.)
Prof. Maurice Leblanc ...	(Agrégé Université de Paris.)
M. H. E. P. Maisonneuir	(Cie. des Lampes.)
M. O. M. Reclus	(Société du Gaz de Paris.)
M. R. de Valbreuze ...	(Société pour le Perfectionnement de l'Eclairage.)

Major G. H. Spittle.

Mr. and Mrs. C. C. Paterson.

Dr. J. W. T. Walsh, Mr. C. C. Paterson, and Mr. Percy Good.

Mr. W. E. Bush.

It soon became apparent to the British delegation that the sea trip was by no means to be a joy ride. No sooner had we recovered from the strain of struggling to our cabins through the mass of returning American tourists (mostly ladies), than Mr. P. Good, our indefatigable deputy leader, called a meeting of our delegates ostensibly for the purpose of making the members acquainted with each other, but actually, as we discovered later, with the much more sinister motive of making us work our passage. In characteristic style he had prepared a chart embodying all the subjects which appear in the official programme, and had subdivided the party into smaller groups, allocating to each the subjects with which they were best acquainted. Leaders were elected for each group, and every day small parties were to be found in solemn conclave in various parts of the ship, endeavouring to settle what should be the British policy on the numerous subjects which were to come up for discussion at the official meetings. This display of energy was a cause of much comment by our fellow passengers, and of great concern to those who so frequently had their bridge parties and other diversions interrupted by having an interesting companion dragged away for a meeting. Our French colleagues were also to be seen engaged in business sessions, and Messrs. Paterson and Walsh obtained a good

deal of exercise in running between the meetings of the two delegations to give advice on questions of organisation. It must not be imagined that there were no moments of relaxation. With dancing every night and male partners at a high premium, the younger members of the party did their best to remove the fallacy that Englishmen are a cold and inhospitable race. It is worthy of note that in addition to the display of mental energy previously mentioned, the British delegation was much in evidence in all the sports and gymnastic exercises. In the latter respect, Professor Macgregor Morris and Major Spittle, of the G.W. Railway, were much to the fore. Punctually at seven o'clock each morning these two stalwarts were to be found in the gym, exercising at high speed, after which they would lead the chase round the decks and leave the rest of the party breathless.

The whole of Saturday afternoon was devoted to a general meeting, at which the leaders of the sub-committees reported the results of their deliberations, which, with slight modifications, received the approval of the meeting. As a result of careful organisation and some really hard work, the British delegation should make a fine team at the coming conferences. On Sunday evening the French and British delegations were the guests at dinner of Monsieur Chappuis and Mr. Paterson. Such an occasion provides the courteous stewards of the Cunard Company with an opportunity to show their efficiency in arranging banquets at short notice. Special menus were printed for the dinner, and the ladies were presented with souvenirs of the occasion. As no formal speeches were allowed, the party contented itself with singing "A Jolly Good Fellow" to our hosts, and "Auld Lang Syne" brought the proceedings to a close. Our French friends were much impressed by this vocal display on the part of their British colleagues. At two o'clock on Monday morning we passed the Nantucket lightship, and as the night was beautifully warm, large numbers of the passengers stayed on deck to give it a cheer. Monday was a day of much excitement, and was reminiscent of a leave boat from France during the war. All day the American passengers were scanning the horizon for a glimpse of home, and when land did come in sight they were overjoyed. We passed the Statue of Liberty in the early afternoon and then settled down for the tedious medical examination and immigration formalities. In the latter respect we were again fortunate, since after waiting for all the American citizens to pass through, the Illumination Congress delegates were given precedence over the remainder of the passengers.

On the quay side we were met by a number of gentlemen from the various Congress committees, who rendered yeoman service in the scramble through the Customs. This formality caused a good deal of embarrassment to the non-English-speaking members of the French delegation, but eventually we all arrived safely, but thoroughly fatigued, at the Hotel Astor. Awaiting us were Mr. Julius Daniels, Mr. G. Merrill, chairman of the tours committee, and other gentlemen who had been working long hours on our behalf. The official proceedings opened on Tuesday morning, September 4th, when the delegates met in the reception bureau for registration purposes. Each was given a neat little badge and a number of papers and books. We then learnt for the first time the extraordinary care with which our American hosts had planned our programme. The entertainment committee had made the most wonderful arrangements for our comfort, amusement, and instruction whilst in New York, and the tours committee had arranged for every minute of every day, from the time we left that city. Each delegate was presented with a leather-bound loose-leaf book giving particulars in the minutest details. We are, at the moment of writing, all engaged in studying these inspiring publications, and praying that our constitutions may stand the strain of the strenuous period that lies before us during the next three weeks.

The Practical Side of Teaching.

A suggestion for enabling members of the technical teaching profession to keep in touch with the practical side of industry.

By AN ENGINEERING LECTURER.

UNDOUBTEDLY some of the most important positions in the engineering industry are those connected with the teaching side of the profession. Such positions are invariably occupied by men of high technical qualifications and a widely varying amount of practical experience. For many years it was the bitter complaint of the practical leaders of the profession that the training given in technical schools and colleges was far too academic. This criticism was just, and resulted finally in efforts being made to meet it by the institution of "sandwich" and similar courses of training, by means of which the student is brought into contact with industrial conditions and problems during his training, so that when he does finally leave his college and enters the profession, it is with a definite practical bias. Thus, so far as the student is concerned, something of a solution for the problem has been found.

But there is another problem for which a solution has not yet been found—how to keep the teacher in touch with the practical side of industry. That such contact is desirable is patent to all, but the means whereby it may be obtained are not so readily discernible. The teaching staff of a technical institute usually consists of a dean or head of the department, with a number of senior lecturers, and also some junior members. The number varies widely from the large staff of a university down to the small *personnel* necessary for a junior technical school. The case of the dean or departmental head has been met by permitting him to conduct a consulting business in addition to his academic duties. This method is not without its disadvantages and has been severely criticised at times, but at any rate it does permit of close contact being maintained with the practical side of engineering. Not infrequently, however, the dean is the man who does less actual lecturing than any other member of the staff. He has administration duties and research work to occupy his attention, and the ordinary hum-drum work of lecturing devolves in the main upon his assistants. How are they going to keep their work fresh and in line with current practice? The problem is a real one.

The following suggestion is put forward by the writer as an attempt at a solution. Consider, for example, the case of the technical staff of a university. Suppose there are ten members, exclusive of the dean, in receipt of salaries varying between £300 and £900 per annum. Let each member, including the dean, have his salary reduced by 2½ per cent. The amounts thus saved may be grouped together, and, aided by a grant from the university funds, a yearly income of, say, £400 may be provided; or, to put it another way, let a fund of £400 be provided by the university and the technical staff.

Negotiations may then be entered into with the various neighbouring industrial concerns and arrangements made for members of the staff, in turn, to spend one

year in their works. That the various engineering organisations would be willing to accede to such arrangements I have not the slightest doubt. They have always shown themselves keen to forward the interests of technical education. The fact of always having one man engaged in industry would mean that an additional member would have to be appointed to the staff. During his year in industry the teacher would not receive his usual salary, but the special sum of £400 set aside for the purpose. Since the various firms would be taking men on to suit the educational authorities, and quite possibly at a time when they little required them, it is difficult to see how they could be expected to pay a salary representative of such assistance. They might, however, be very willing to make some grant, which, added to the £400 already earmarked, would reduce the year's loss to the individual concerned. A rule could be made prohibiting a man receiving more than his normal salary. Some idea of the working of the scheme may be obtained from a study of the following table :—

Year.	Member of staff.	Normal salary. £	Firm engaged with.	Position.	Remuneration from Grant. £	Firm. £	Total. £	Remarks.
1928	B	600	R. & Co. Elec. Mfrs.	Designer	400	200	600	
1929	C	290	S. Cons. Eng.	Assistant	400	50	450	Only rec'd £290
1930	D	850	T. Rly.	Permanent Way Eng.	400	100	500	Plus £160 from 1929
1931	E	500	U & Co. Shipb'ld'rs	Designer	400	40	440	

It may be objected that men cannot be expected to sacrifice £100 or more of their salary, even in order to keep their teaching fresh and up-to-date; I do not agree. I have mentioned a minimum figure of £400, which should be ample for a man's essential requirements for one odd year, and might easily be increased. But I have great faith in the technical teaching profession of the country, and do not doubt it would gladly embrace any scheme which would enhance its own value and efficiency, even at slight financial loss to individuals. Further, the year in industry would only occur about once in every decade, but would still be sufficient for a thorough acquaintance to be made with current engineering practice.

In the case of the smaller institutions with a total *personnel* of only three or four, doubtless two or three such schools could group themselves together under the scheme, and take turns in sending a teacher into industry.

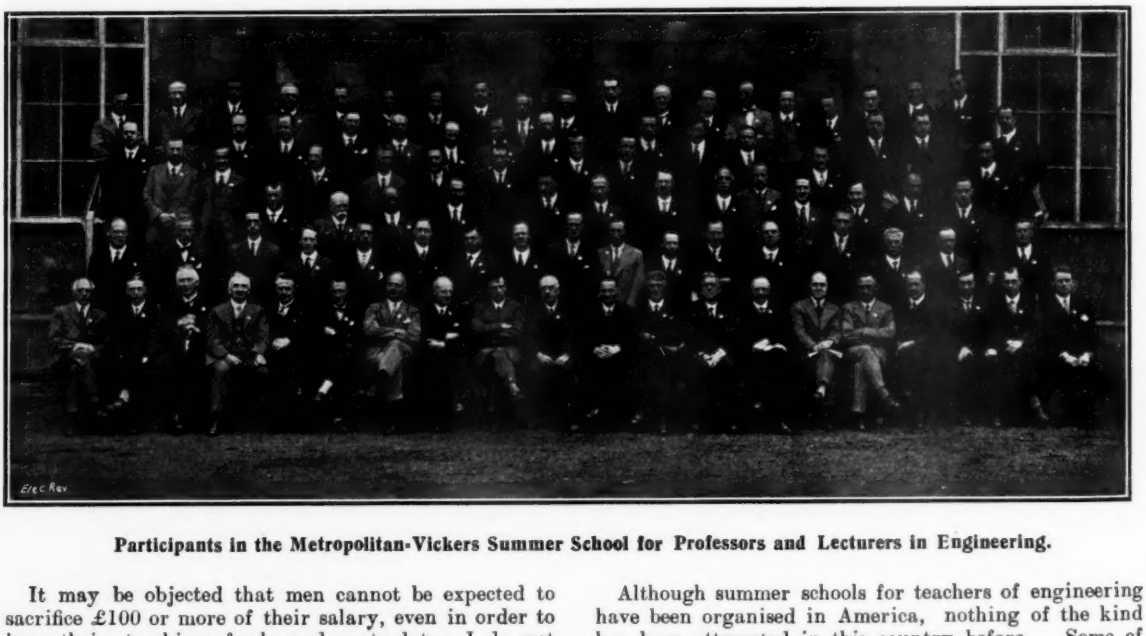
I have outlined my scheme very crudely and briefly: many points would have to be considered, and many difficulties overcome; but if the idea contributes in any degree to a more efficient technical teaching organisation the writer will be satisfied.

A Teachers' Summer School.

A Practical Innovation at Manchester.

AN attempt to solve the problem of the practical aspect of teching engineering students, in connection with which a useful suggestion is made in the foregoing article, materialised last week at Manchester, when the Metropolitan-Vickers Electrical Co., Ltd., conducted a Summer School for Professors and Lecturers in Engineering at its Trafford Park works. Each morning and afternoon session commenced with a lecture, followed by the detailed inspection of plant and equipment in course of manufacture in the shops, and then a discussion. The subjects dealt with included the design of switchgear, large machines, motors, steam turbines and condensers, and electric traction equipment. "The Engineering Graduate in Industry" was discussed, the Company's research policy and problems were outlined, and demonstrations witnessed in the laboratories.

Members of the "school" also attended the Apprentice Association's swimming gala, visited the Manchester College of Technology, and the municipal power station at Barton; they were received at the Town Hall by the Lord Mayor and Lady Mayoress for afternoon tea, and entertained at dinner by the Company.



Participants in the Metropolitan-Vickers Summer School for Professors and Lecturers in Engineering.

Although summer schools for teachers of engineering have been organised in America, nothing of the kind has been attempted in this country before. Some of the distinguished teachers who participated will be recognised in the accompanying illustration, and the enthusiasm with which they entered into the spirit of the venture is an indication of the welcome they accorded it. The Company is to be congratulated upon its enterprise, and the experiment demonstrates a breadth of outlook which other engineering organisations would do well to copy, for its more general adoption would mean a great deal to the electrical industry. The subject is dealt with in our leading article.

It seems curious, to say the least, that our teachers should not be provided with facilities for seeing what they teach in their schools put into practice, and learning all that is newest in practical application, whilst professors at technical colleges in Germany apply for, and obtain, permission to spend their holidays in British engineering establishments. Many Germans spend part of their vacation in that way, but seldom do we hear of teachers doing likewise in this country, though surely their holidays are long enough for a little relaxation to be sacrificed.

The Municipal Tramways and Transport Association.

Annual Conference at Manchester.

THE 27th annual conference of the Municipal Tramways and Transport Association was held in Manchester last week, under the presidency of Alderman J. Bowes (chairman of the Manchester Corporation Tramways Committee). The Conference proper opened in the Town Hall on Wednesday morning, and the Association was given a civic welcome by the Lord Mayor of Manchester (Councillor W. Davy), who made reference to the recent and unexpected death of Mr. Mattinson, the late general manager of the Manchester Corporation Tramways, and paid a high tribute to him, both as an official and as a man.

After a vote of thanks had been passed to the Lord Mayor for his kind welcome, Alderman Bowes's presidential address was read by the general secretary, Mr. J. Beckett.

Presidential Address.

By Alderman JAMES BOWES, J.P.

(*Abstract.*)

Still more and more vehicles come on the road. The latest comers are the railway companies. What the effect of their coming will be, first, upon themselves, second, upon the roads, and third, upon those already there, no one can foretell. During my presidential year the Council has been engaged mainly upon the Railway Companies (Road Transport) Bills. It has been concerned to preserve the interests which local authorities have created by the express sanction of Parliament in facilities for the conveyance of road passengers. The systems which this Association represents and operates have cost:—For tramways, £78,790,595; for motor omnibuses, £3,477,821; for trolley vehicles, £739,143; a total of £83,007,559. They carried over 4,392,000,000 passengers last year, and employed about 87,000 persons. Outside London, the combined local authorities are the largest operators of 'buses, of which there has been a great expansion during the year. It is pre-eminently our business to provide 100 per cent. efficiency and sufficiency, whether we are isolated or co-ordinated. Our strongest defence against aggression will be the completeness of our services and the unity of our purpose.

There are some people who are so far out of touch with the trend of the times that they talk lightly of local authorities disposing of the services to private interests, because, forsooth, Parliament at present cribs and cabins and confines them within narrow limits. Can you imagine the road passenger conveyance services of Manchester in the hands of a private company with, say, £1 ordinary shares of the Manchester and District Passenger Transport Company (let us call it that) quoted on the market at 150 per cent. premium? The democratic spirit of the community would quickly leap into activity and make short work of non-municipal men in municipal power putting up City franchises for auction.

To return to the Railway Bills, the railway companies went to Parliament this year for practically universal powers to operate road vehicles to be exercised without restraint or control. It was doubtless the big majority for the second reading of the Bills, obtained upon the understanding that local authorities would receive protection, that led their witnesses to spurn every suggestion of restriction. They put forward claims to compete anywhere with anybody—whether with statutory or non-statutory undertakings did not matter. The outcome of the long and costly investigation of the Bills is that we have got what is called "internal protection" for local authorities; that is, the companies have not to compete within the areas of the authorities. I am sure you will agree with me in emphasising the wrong, moral and financial, which has been done by Parliament to those local authorities that have, under statutory power, constructed and reconstructed tramways outside their own boundaries and spent large sums of capital in doing so. They have all acted in good faith and constitutionally. It seems a reasonable view to take that Parliament should conserve what Parliament has granted, and that one statutory authority should not, with Parliamentary sanction, be placed in a position to jeopardise or possibly destroy the capital of another undertaking which is itself a creation of Parliament.

Every effort was made to induce a private member to re-introduce the Omnibuses Bill into the House of Commons during last session. That was the only course open to us, for, as an association, we cannot promote a Bill in Parliament. We must make up our minds to renew our efforts until they are crowned with success. The coming year promises to be a most important one. The Royal Commission on Traffic which the Government has appointed has a great task in hand, and if it can find some solution of the problem, tangled as it is with conflicting interests, it will deserve well of the British public. In that task this Association will render all the assistance in its power.

Alderman A. G. ELLAWAY (Birmingham), who proposed a vote of thanks to the president, referred to the Railway Companies' Bill and the Association's Omnibus Bill, and expressed regret that the efforts made in those two directions had not been more successful.

The result of the essay competition was then announced. This year 56 papers had been sent in, nine on finance, 22 on traffic, and 25 on engineering. The winners were as follows: Mr. Edgar Ashby (Birmingham), silver medal and £15 for a paper on "Operating Cost Accounts of Motor 'Buses"; Mr. Henry Mittell (Edinburgh), silver medal and £15 for a paper on "Methods of Maintenance, Repair and Overhaul of a Motor 'Bus Fleet"; Messrs. J. W. Dunning (Cardiff) and R. C. Moore (Sheffield), silver medal and £7 10s. each for papers on "Principles and Practice of Co-ordinated Motor 'Bus Services." The Council's report and the accounts for last year were then presented and adopted. Special reference was made to the fact that the Committee on Overhead Equipment had re-drafted all the drawings, and that the revised copies would be available shortly.

Mr. A. Baker, late of Birmingham, and Mr. T. B. Goodyer, of Croydon, were elected honorary members. Mr. W. Chamberlain was elected president for the coming year, and it was mentioned that the conference would then be held at Belfast. Alderman T. Canby (Huddersfield) was elected vice-president, Mr. A. R. Fearnley (Sheffield), hon. treasurer, and Mr. F. C. H. Wiltshire (Birmingham) honorary solicitor.

The Association was entertained to an informal luncheon in the Town Hall by the Lord Mayor of Manchester. In the afternoon the following paper was presented and discussed.

The Progress and Development of the Transport Undertakings of Local Authorities.

By HARRY POTTS STOKES.

(*Abstract.*)

The first electric tramway system introduced in this country was at Blackpool in 1884-85. In 1900 the introduction of electric tramways spread throughout the country like an epidemic to both large and small towns, and in many of the latter where there was not the slightest prospect of extension. When local authorities first began to establish transport services, the opinion was freely expressed that that would be the end of development. The enormous development and extensions which have since taken place throughout the country have completely upset the conjectures of those pessimists. Tramways, by reason of the fact that municipalities have consistently run their undertakings in the public interest and not for private gain, have done more for the benefit of all classes of citizens than any other section of industry.

The development of the unequal-wheel maximum traction truck with one motor has produced the most successful type of four-wheel bogie used in this country, due no doubt to low initial cost and low operating and maintenance expenses. With at least 70 per cent. of the load carried on the driving wheels the adhesion is increased to an amount which enables the car to take grades easily, start and accelerate rapidly; at the same time sufficient weight is carried on the pony wheels to keep them safely on the rails under all conditions. With the light-weight motors now available and wheels of 25- to 26-in. diameter, equal-wheel bogies with side bearings could with advantage replace the 32-in. diameter driving wheel maximum traction truck without increasing the total weight or the height of the floor level, and would give as near perfect adhesion and acceleration as possible with electric traction.

Until quite recently all developments in tramcar design involved additional weight, and in several places which I visited where new stock was being constructed the great ideal appeared to be how much additional steel and timber could be incorporated in the tramway car body and truck. On the other hand, the motor vehicle manufacturer very quickly realised that added weight meant decreased efficiency.

The present day rigid truck type of tramcar shows considerable advancement. Instead of being a collection of rough castings and drop forgings just put together, it is now turned out as a thoroughly sound engineering job, all parts being accurately machined and fitted; the gear case, brake rods and springs are of sound-proof materials, the floor boards are interlined with felt, and, in lieu of the former method of wooden laths on the floor, rubber matting or cork carpet is now used.

The designers of the cars of the future should aim at simplicity in design. The vehicles manufactured in the workshops of local authorities have done more than anything else to stimulate progressive improvement in design, and the experiments carried out by their engineers have made possible

improvements in technical equipment years ahead of normal commercial development.

The permanent way is a most valuable portion of our equipment, and considerably more attention should be paid to keeping the rail contour correct to secure steadier running. Increased life and good track are essential factors in securing future development, and these can only be secured by adopting modern maintenance methods—cheap maintenance is the first stage of scrapping.

The latest type of Plymouth tramcars are fitted with three-point suspension radial maximum traction trucks, 4-ft. wheel base, 26-in. driving wheels, 22-in. pony wheels; 14-ft. 6-in. pivotal centres; Westinghouse straight air brakes; hand brake; and magnetic track brakes interconnected with air braking available for independent or joint operation. The bodies are manufactured in our own works; overall length 33 ft.; light steel gussetted underframe; frame-work of teak with double tenoned joints built under compression and held taut by light flat section truss rods.

Discussion.

Alderman F. SMITH (Liverpool) spoke of the disabilities that tramways were still working under as regarded road maintenance, rating, &c.; experience in Liverpool showed that there was need both for tramways and 'buses.

Mr. R. S. PILCHER (Edinburgh) said that the jazzing of tramcars at the present time was one of the disgraces of electric traction in this country. In Edinburgh, by strict attention to the design of single-truck vehicles, he had been able to eliminate jazzing and also, very largely, noise. The tramcars had a long wheel base and a modified axle box; the chief thing was to keep the check plate tight. As a result, the rails were wearing flat, and there was no coning either of the rails or the wheels.

Alderman C. W. BEARDSLEY (Sheffield) urged that the transport authorities of the country should get together and co-ordinate their services in the public interest.

Mr. H. MOZLEY (Burnley) said that the special type of truck in use in Burnley had 10 per cent. more weight on the driving axle because the king pin was in the centre of the axle and not in front of it.

Mr. J. BARNARD (Bolton) said that whilst he had gone in for eight-wheel tramcars, he had four equal wheels and four pony wheels.

Mr. A. R. FEARNLEY (Sheffield) agreed that if rolling stock was out of date and there was not the money to bring it in accordance with modern plant, then the whole tramway system should be scrapped and 'buses used. He contended that in many towns energy for tramway purposes could be supplied at about 0.75d. per unit; in Sheffield the price was 0.8d. If tramcars were up-to-date, comfortable, and attractive, they would receive the patronage of the public, and there would not be much difficulty in maintaining the position of municipal tramways.

Bailie PETER BURT (Glasgow) said that there were great possibilities in the reduction of the weight of tramcars by the use of aluminium.

Mr. J. M. CALDER (Reading) pointed out that in some towns it appeared to be necessary to reduce the seating capacity of the cars, as quite a number were running with only one-third of their seating capacity occupied for a great part of the day.

Mr. P. PRIESTLY (Liverpool) did not agree with eight-wheel car equipment, and said that with single-truck cars in Liverpool there was no jazzing. Indeed, he had the permission of the Ministry of Transport to run certain of his cars at 30 miles an hour.

Mr. STOKES, in the course of his reply, said that one of the stumbling blocks to progress in the tramway industry was that those concerned had been too self-satisfied. His idea of a modern tramcar was very different from the reconstructed cars of Mr. Mozley, and Mr. Priestly was the only one who had got anywhere near what was in his mind. He challenged anybody to prove that a really up-to-date tramcar could not be made as quiet as a modern 'bus.

On Thursday morning the following paper was read and discussed:—

The Policy and Outlook Relating to Passenger Transport Services of Local Authorities.

By Alderman J. K. CHEETHAM, J.P.

(*Abstract.*)

There is a distinct feeling of unrest among tramway operators. It is estimated that 87,000 private 'buses are at present operating in this country on scheduled routes. While most of these services are serving country districts, many of them are touching our big towns and running over tramway tracks.

The entrance of the railway companies into the realm of road transport is a very serious matter. It is useless to blink our eyes to the real danger that confronts tramway authorities. The railway companies have gone to enormous trouble and expense in order to obtain their powers to operate road transport services, and they will not put their new powers quietly away. They will seek to use them to the utmost. It is a notorious fact that when the railway companies secured such an overwhelming vote for the second reading of their Bills, their attitude to tramways on the question of compromise changed entirely. It was owing to a large extent to the magnificent efforts put forward by this Association that those authorities which operate only within their own areas obtained complete protection against the Railway Companies' threatened invasion. It is recognised that the Bills obtained their big majority on second reading because of the pledge given by the Minister of Transport that "municipal authorities should be adequately safeguarded." When the Bills were reported to the House of Commons Mr. T. Kennedy called attention to the very inadequate safeguards granted to local authorities for "external services." Local authorities must equip themselves for the fight. Some have already done so and are therefore all the stronger to meet the threatened onslaught. In my view, any attempt to fight the railway companies' 'bus services, except with up-to-date rolling stock, is foredoomed to failure.

If private enterprise is permitted to overrun the urban districts with 'bus services, it will be impossible to force them for long to unload their passengers at borough boundaries. Agitation will spring up to insist upon passengers being brought to or near the centres of towns, and the concession cannot long be delayed. Any attempt to fight such a service with tramcars would end in disaster, so that the arrangement whereby they are allowed to run in under proper conditions and with adequate protection needs the most careful consideration, if the public interests are to be safeguarded.

There must be developed new services with a view to future requirements. We must enter into co-operation with other local authorities which are similarly situated to make co-ordination possible. We must not be afraid to enter into negotiations with large and established 'bus companies that have secured a sort of privilege of entry into municipal territory. I am prepared to argue that working arrangements with such companies should be welcomed, to operate either with one or more local authorities on an equitable basis. There must be a large increase of inter-town communication by "express" services. On October 1st, 20 miles per hour will become legal on pneumatic tires. We must press for a complete overhaul and revision of the law relating to motor 'bus licences. There must be increased attractiveness in our rolling stock and increased comfort in the vehicles. Let us advertise and tell the public what we are doing. There must be exercised the strictest economy in our administration. To many minds economy means a refusal to spend; true economy means wise expenditure.

Discussion.

Mr. W. VANE MORLAND (Walsall) said that the time had come for a careful consideration of the whole position of the smaller undertakings. For the busy provincial towns he suggested the necessity, in the near future, of underground means of communication.

Councillor J. H. WHITAKER (Todmorden) complained that whereas the railway companies did not require to obtain the consent of the Ministry of Transport before commencing a service, municipalities had to if the service was outside the borough.

Mr. E. S. RAYNER (Hull) said that they must be prepared, not only to enter into agreements with other corporations, but also with the established 'bus companies, if the transport of the country was to be co-ordinated on satisfactory lines. The time was rapidly approaching when it would be unwise and certainly uneconomic any longer to give the passenger the choice of two or three alternative means of transport for the same journey.

Alderman T. WOFFENDEN (Huddersfield) urged the necessity for co-ordination of the licensing authorities, so that the small local authority would not stand in the way of necessary developments.

Mr. R. S. PILCHER (Edinburgh) said that the sooner the controversy between the tramcar and 'bus was dropped the better, because there was a place in any large town for both.

Mr. P. M. ROBINSON (Chesterfield) suggested the appointment of a Committee to investigate recent trolley-vehicle installations and to place all the facts before the Association.

Mr. J. S. D. MOFFET (Salford), referring to the question of co-ordination, contended that the municipalities had not been asleep and instanced the inter-running arrangements between Manchester and the surrounding areas. About 25 undertakings had in this way been brought under one traffic authority, and some of the biggest 'bus companies in the country came within that scheme.

Bailie P. J. DOLLAN (Glasgow) said it was ridiculous to expect to compete with a 'bus company which could come to a decision over the week-end when the Corporation took six months; municipal tramway managers should have the same scope and authority as company managers.

Mr. N. J. YOUNG (Newport, Mon.) said that in the vicinity of Newport a company had been formed to develop a substitute for imported motor spirit and that substitute would be marketed fairly shortly at a reasonable price.

The author briefly replied.

After the discussion the Association was entertained at an informal luncheon in the Town Hall by the chairman, deputy chairman and members of the Manchester Corporation Tramways Committee. In the afternoon the greater part of the time was devoted to the demonstration of motor 'buses, which has now become a feature of the conferences. In the evening, there was a reception and dance at the Town Hall at the invitation of the Lord Mayor.

Friday was spent in an inspection of the Manchester Ship Canal as far as Ellesmere Port, and also in a visit to Chester.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments. Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

The Factory Lighting Campaign.

We have received copies of the first of the circulars, with enclosures, which are being sent to over 100,000 factory owners and managers during the Factory and Workshop Lighting Campaign. The letter mentions the advantages of adequate electric lighting and says:—"Men and women work more accurately and quickly where the light is good. Experience shows also that accidents are less frequent with modern lighting. In this age of keen competition, when every organisation is endeavouring to increase output, no one can afford to be without an up-to-date lighting system. Official tests prove that good lighting not only pays for itself, but earns substantial dividends." A booklet (E.D.A.726) is enclosed, in which several standard patterns of reflector are illustrated and described and views of contrasted good and bad lighting appear. Another enclosure is an addressed postcard upon which there is a list of publications upon industrial illumination, any or all of which can be obtained for the asking.

Radio Manufacturers and Marconi Royalties.

As we mentioned in our last issue, a meeting, called by the Radio Manufacturers' Association, was held in London last week to consider the position arising out of the decision of the Comptroller-General of Patents with regard to the royalties payable to the Marconi Company by the Brownie Wireless Co. of Great Britain, Ltd. Mr. A. Bowyer-Lowe, chairman of the R.M.A., presided, and outlined the situation. He said that they were all agreed that the one thing necessary to stimulate the sale of radio apparatus was a reduction of the royalties. Therefore, after taking counsel's opinion, the Association, through the Brownie Co., brought a test case, and a satisfactory decision was obtained. Their legal advisers were of the opinion that all other radio manufacturers were entitled to the same terms as the Brownie Co., but the Marconi Co. had refused to meet them. Accordingly the Association's Royalties Committee advised all members to communicate with the Marconi Co. intimating that they considered that their existing manufacturing licences were rendered null and void by the Comptroller-General's decision, and announcing that they proposed to operate under the new terms and conditions pending the receipt of a new licence. He (the chairman) considered that the Marconi Co. had been treated very generously, but an appeal against the decision had been lodged. The Association had decided to support any manufacturer who was proceeded against by the Marconi Co. for adopting the procedure now recommended.

After some discussion of details a resolution was passed giving effect to the recommendations of the Royalties Committee. It is understood that the result will be an immediate reduction in the price of receiving sets; some manufacturers have already drawn up revised price lists.

Social Event.

At Holborn Baths, on September 7th, the G.E.C. Swimming Club made its first public appearance, when it completed the final events of the various tournaments which have been running throughout the season. There was a large attendance. The club recently formed by the Sun Electrical Co. won the men's team race. The prizes were distributed by Mrs. L. C. Gamage, who was instrumental in founding a ladies' section of the Club some seven years ago.

China's Electrical Trade in 1927.

In the recently issued report of the Inspector General of Customs on the trade of China in 1927, it is not surprising to read that the unhappy conditions obtaining in the Yangtse Valley reacted on the trade in electrical materials. During the year nothing in the way of profitable business could be recorded either in this district or in South China. The demand for accessories declined and, as an additional factor in a bad year's trade, the hot weather set in somewhat late, so that the sale of electric fans, among other articles, was affected. In the North, however, where comparatively peaceful conditions prevailed, the situation was far less unsatisfactory. Activity was displayed in the extension of existing plant and in the inception of new enterprises both at the ports and in the interior. From the ex-German concession at Tientsin an order for electrical plant went to Japan, to supply the needs of that settlement. In Manchuria a brisk business also developed in the sale of telephone materials. The proposed introduction of an automatic telephone system of 1,500 lines at Mukden and the establishment of a long-distance line connecting Harbin with Vladivostock were factors which helped to compensate the electrical trade in some measure for losses sustained elsewhere. The total value of electrical materials and accessories imported into China during 1927 was 9.9 million Haekwan taels, as compared with 8.9 million taels in 1926, and 6.9 million taels in 1927, the share taken by the principal countries of origin in the first three years being as follows:—

	1925. Hk. Tls. (3s. 5¼d.)	1926. Hk. Tls. (3s. 1¾d.)	1927. Hk. Tls. (2s. 9 13/16d.)
Japan	2,367,000	3,407,000	4,090,000
Great Britain ...	1,199,000	1,666,000	1,589,000
United States	851,000	1,422,000	1,561,000
Germany	1,393,000	1,351,000	966,000
Hongkong	421,000	379,000	778,000
Russia (Pacific Ports)	70,000	199,000	281,000
France	122,000	215,000	243,000
Belgium	123,000	109,000	213,000
Holland	283,000	194,000	123,000

Our Radio Export Trade.

The *Wireless Trader* publishes figures of our radio exports during July showing that the total value was £75,910, including valves £14,738. Australia was by far the most important buyer, her share amounting to £16,992 (valves £7,288). Chile was next in order, being credited with £6,096 (valves £10). Then followed the Netherlands with £5,537 (valves £6), South Africa, £5,465 (valves £1,483), France, £5,042 (valves £381), Argentina, £3,299 (valves £483), New Zealand, £2,545 (valves £364), and Peru, £2,360 (valves £313). It will be seen that the Latin-American market is of some importance to the radio export industry.

J. H. Holmes & Co.

We are informed that a company is now being formed with a substantial backing to take over the business of J. H. Holmes and Co., electrical engineers, Newcastle-upon-Tyne, and that arrangements have been made whereby in the meantime manufacture will be continued and all customers' requirements dealt with.

Leeds Electrical Club.

At a general meeting held on September 10th, the Committee of this Club was empowered to accept an offer made by the New Leeds and County Liberal Club, Ltd., for part use of their premises at Quebec House, Leeds, for the purpose of headquarters of the Club. The premises are situated in the centre of the city and the Club has rooms allotted for its exclusive use together with the use of the Club's dining room and billiard room on an equal footing with the Liberal Club's members. The entrance fee was fixed at £2 2s., and the annual subscription at the same figure for the full members. In the case of country members, whose residence or business address must be beyond a radius of 25 miles from Leeds, there will be no entrance fee and the annual subscription will be £1 1s. The Club will be open daily, except Sundays. Subject to the prior claim of the Liberal Club's members the bedrooms may be used by the Leeds Electrical Club's members. There are already 120 members, and an influx of new members is expected now that the premises have been secured. In the unavoidable absence of Mr. W. B. Woodhouse, the president, the chair was taken by Mr. J. Douglas Green. Further information can be obtained from the hon. secretary, Mr. S. T. Needham, at 10, York Place, Leeds, or at the Club's headquarters, Quebec House, Leeds.

International Wire Manufacturers' Decision.

The International association which regulates by agreement the machine drawn wire trade, met on September 11th at Chateau d'Ardenne. The principal decision taken was one with regard to an increase in the price of wire. An important international conference of nail and wire manufacturers was held on September 10th at the Chateau at which nearly all the European manufacturers were represented. The English manufacturers who are particularly interested in wire netting were represented at this conference, the main object of which was to come to an agreement which would form the basis of a new understanding as the cartel which formerly existed broke up a few months ago.—*Reuter* (Brussels).

Newspaper Office Lighting.

A large number of electric lighting units, specially designed by the Manchester branch of the General Electric Co., Ltd., to the instructions of Mr. A. Rangeley, L.R.I.B.A., have been installed at "Allied House," the Manchester headquarters of Allied Newspapers, Ltd. On the ground floor, the main entrance, which forms the subject of the accompanying illustration, has twenty-two 16-in. "Equiluxo" bowl pendants with cast bronze metal work. These are supplemented by sixteen 3-light bracket fittings of similar finish, which are mounted on the top of the grill, the entrance hall being illuminated by one 20-in. bowl fitting with four 6-in. spherical globes to match, the metalwork also being of cast bronze.

G.E.C. Fittings at "Allied House."

Two bronze 2-light brackets, also with 6-in. spherical globes, supply the porch lighting, while three similar units are installed on the staircase. On the first floor landing a 16-in. bowl pendant unit with cast bronze metal work is installed. The offices on the first floor are illuminated on similar lines, the units consisting of thirty-two 14-in., fourteen 10-in., and one 12-in. bowl fittings. The outside lighting units are fashioned in cast iron, finished black, and comprise four large lantern brackets of a very attractive design.

Prosperity in the Machine Tool Trade.

Sir Alfred Herbert, president of the Machine Tool Trades Association, issued a statement to the newspaper Press last week showing that the machine tool trade, which had passed through a period of depression since the war, was now in a better position with regard to the volume of orders on hand than at any time since 1920. The trade was one of the barometric industries, being the basis upon which all manufacture ultimately depended, and for the past twelve months it had experienced a steady and cumulative improvement in demand. To-day many of the machine tool makers found themselves unable to cope with the demands made upon them in spite of the fact that overtime was general throughout the industry and night shifts were being worked in many shops. The object Sir Alfred had in view in issuing his statement was to help to remove the spirit of despondency that had naturally followed upon a prolonged period of unemployment which showed little or no signs of improvement. He went on to say that it might seem strange that when so many important industries were still depressed the machine tool trade should be in the above position, but it was noteworthy that the lesson that efficient equipment was the first essential of manufacturing was being more and more fully recognised. Since the Machine Tool Trades Exhibition of 1924 great strides had been made in machine tool design, rendering much more rapid and efficient production possible. Other evidence justifying optimism was the fact that the attendance at the 1928 Exhibition was 50 per cent. greater than at that of 1924, and most gratifying business was being done by exhibitors.

Bankruptcy Proceedings.

J. E. DAWSON, wireless engineer, High Street, Boston, Lincs.—The first meeting of creditors was held on September 10th at Boston. The statement of affairs showed gross liabilities of £4,180, of which £3,009 was expected to rank, against assets of £1,133, leaving a deficiency of £1,876. Debtor attributed his failure to illness of himself and his wife, and depreciation of stock. He commenced business as a manufacturing electrician with £60 capital. In 1924 he purchased a plot of land in High Street and erected his present house and shop at a cost of approximately £1,800, the shop being opened in April, 1925. The creditors appointed Mr. C. G. Compton, 5, Church Close, Boston, as trustee of the estate, together with a committee of inspection.

H. NUTTALL (trading as J. A. Hartley & Co.), 1073, Chester Road, Stretford, electrical agent and factor.—Last day for receipt of proofs for dividend, September 26th. Liquidator, Mr. F. Murgatroyd, Senior Official Receiver, Byrom Street, Manchester.

E. W. KIRK (Ace Radio Manufacturing Co.), wireless apparatus maker, 26, Curzon Street, Derby.—Bankrupt discharged subject to consenting to judgment for £24 being entered against him by the Official Receiver and £1 10s. costs of judgment.

F. V. LAMBERT (Lambert & Curley), electrical contractor, 27, Parrock Street, Gravesend.—Trustee, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C., released July 6th, 1928.

C. H. DAVIES, electrical engineer and contractor, 6, Stamford Arcade, Ashton-under-Lyne.—Last day for proofs for dividend, September 29th. Trustee, Mr. J. Davis, Official Receiver, Byrom Street, Manchester.

L. A. N. DIXON (C. Forgham & Co.), electrical engineer, 23a, Princess Street, and Old Post Office Yard, Shrewsbury.—First and final dividend of 3s. 11½d. in the £, payable September 24th, at the Official Receiver's office, 22, Swan Hill, Shrewsbury.

Company Liquidations.

CECIL HODGES & Co., LTD., electrical engineers, Dalston Lane, Hackney, and Empire Works, Horley, Surrey.—The statement of affairs filed in the compulsory liquidation of this company shows unsecured liabilities of £16,503, assets of £2,521, and as regards shareholders, a deficiency of £28,481. The following are creditors for amounts over £50:—

	£		£
Abbott, A. L.	60	Leach, S. G., & Co., Ltd.	87
Bolton, T., & Sons, Ltd.	264	Littons Machine Tool Co., Ltd.	194
Brown & Tawes, Ltd....	134	Midland Elec. Mfg. Co., Ltd.	141
Burton, Delingpole and Co., Ltd.	141	Herbert Morris, Ltd. ...	79
Brion Leroux Jeanno et Cie.	1,489	McNamara & Co. (1921) Ltd.	85
Bellows, J.	81	Pompes, S. A. M. ...	440
Buck & Hickman, Ltd.	269	Roneo, Ltd.	56
Barnes, F. A.	50	Scott, H. J., & Co., Ltd.	480
Bromley-Langton Elec. Wire Co.	179	Statter, J. G., & Co. ...	107
Canning, W., & Co. ..	50	Steel, F., & Co. ...	184
Chloride Elec. Storage Co., Ltd.	645	Swain, J., & Son, Ltd.	71
Cooks (Finsbury), Ltd.	58	Southern Railway Co.	129
City Electrical Co. ...	77	Stenning, W., & Sons...	199
Delta Metal Co., Ltd....	87	T.B.T. Electric Co., Ltd.	344
D.P. Battery Co., Ltd.	87	Tudor Accumulator Co., Ltd.	94
Ebonestos Insulators, Ltd.	85	White Elec. Inst. Co., Ltd.	229
Ferranti, Ltd.	75	Wilmer & Sons, Ltd. ...	705
Gaywoods Bronze Co.	92	Whipp & Bourne, Ltd.	109
Harris Plating Works, Ltd.	102	Willcox, W. H., & Co., Ltd.	54
Holt, G., Ltd.	59	Young, T. W.	89
Hodges, H. C.	990	Post Office Telephones	67
Hart Accumulator Co., Ltd.	226	McQueen, H. A., & Co.	127
Jarvis, J., & Sons, Ltd.	4,417	Dodwell & Co.	60
Kenrick & Jefferson ...	115		

WOODHALL & PARTNERS, LTD., electrical and mechanical engineers, Swansea.—A meeting of creditors was held on September 14th, in London. Mr. D. C. Evans, 18, Ironmonger Lane, E.C., occupied the chair, and submitted a statement of affairs which showed liabilities of £8,365, and net assets of £1,132, leaving a deficiency, so far as the creditors were concerned, of £7,233. The liquidator stated that the fixtures and fittings represented a substantial expenditure which would be of no value in a winding up. The stock consisted of factored goods and the bad and doubtful debts were the accumulation of a period of years. The total loss on trading was £6,672. The issued share capital of the company was £1,530, and the deficiency as regarded the contributories was £8,762. The company was formed in October, 1923, to carry on the business of electrical and mechanical engineers. It was resolved that the appointment of Mr. D. C. Evans should be confirmed, and an advisory committee was appointed consisting of Mr. J. Wright and the representatives of Messrs. Corfield & Cripwell, and Messrs. Weiss, Biheller and Brooks. The following are creditors:—

	£		£
A.E.G. Machinery Co. ...	26	National Lamps, Ltd. ...	33
Cable Accessories Co., Ltd.	94	Philips Lamps, Ltd. ...	22
Dawson & Son	32	Smith & Ansell	21
General Electric Co., Ltd.	34	Falk, Stadelmann & Co., Ltd.	34
General Cable Co. ...	300	Reval Co.	93
Matthews, F. J., & Co....	42	United Electric Co. ...	21
		Weiss, Biheller & Brooks	100

MANCHESTER MAGNETO CO., LTD.—The adjourned meeting of creditors was held on September 13th at the offices of Messrs. A. L. Price & Co., 8, Exchange Street, Manchester. The statement of affairs submitted showed liabilities of £3,192, and net assets of £72, leaving a deficiency so far as the creditors were concerned of £3,120. The issued capital of the company was £400; thus as regarded the shareholders, there was a deficiency of £3,520. The company was registered in 1925 with a capital of £1,000. At the outset it traded at Liverpool Road, Manchester, but in April, 1927, removed to Hardman Street, Deansgate. During the first year, the turnover was £2,774, but in the following 12 months, it increased to £5,215. During the last year, the turnover had only been £1,774. The

loss on trading was attributed to the heavy overhead expenses following the removal, too large an indoor staff, and the retail prices obtainable being too small. It was decided to confirm the voluntary liquidation of the company with the present liquidator.

New Shipston Lighting Co., Ltd.—A meeting of members is called for October 11th at The Hostel, Shipston-on-Stour, to hear an account of the winding up from the liquidator, Mr. F. B. Hancock.

Electric Furnace Co., Ltd.—A meeting of members is called for October 12th at 17, Victoria Street, S.W.1, to hear an account of the winding up from the liquidator. Mr. A. A. White.

General Radio Co., Ltd.—A meeting of members will be held in Room 19, Kimberley House, 14-17, Holborn Viaduct, E.C., on October 11th, to hear an account of the winding up from the liquidator, Mr. P. S. Booth.

Wm. Muirhead, MacDonald, Wilson & Co., Ltd.—Winding up voluntarily. Liquidator, Mr. J. B. Neilson, 5, Walbrook, E.C., appointed September 6th.

Private Arrangements.

W. Jones, trading as "Radio and Electrical Supplies," electrical and wireless dealer, 37, Lakefield Road, Llanelly.—A meeting of creditors was held on September 13th at the offices of Messrs. E. T. Collins & Son, 28, Baldwin Street, Bristol. The statement of affairs disclosed ranking liabilities of £795, and net assets of £140, leaving a deficiency of £655. Mr. A. Collins reported that shares held as security by the bank represented the capital with which the debtor started business in 1924. The bank also held collateral security in the shape of shares deposited by relatives. The accountants were unable to submit any trading figures, owing to the absence of a complete set of books. The bank passbook showed that the takings had varied from £29 to £160 per month, whilst the drawings had been £4 weekly. The deficiency was attributed to loss on trading, and bad debts. Mr. D. Jennings, solicitor, Llanelly, stated that debtor had no definite offer to make, but friends were prepared to come forward and assist him in repurchasing the assets from the trustee. A resolution was passed confirming the deed of assignment already executed to Mr. Collins. The following are creditors:—

	£		£
Brown, S. G., Ltd. ...	56	Fuller Accumulator Co.	286
Edison Swan Electric Co., Ltd.	69	Siemens Electric Lamp and Supplies, Ltd. ...	29

M. Baynes and E. H. Newman, trading as "The Langham Radio," 96, Regent Street, W.1.—A conference of the principal creditors was held recently at the offices of Messrs. W. H. Cork & Co., 19, Eastcheap, E.C. Mr. W. H. Cork submitted an approximate balance sheet which showed that the assets exceeded the liabilities by some thousands of pounds. Mr. Cork added that he was consulted by the partners as they were being pressed, and as a result of over-trading, were unable to meet their "prompts." The turnover of the business exceeded £150,000 per annum, and large profits were being made. The present position was due entirely to over-trading. The partners were anxious that everyone should be paid in full, and were of the opinion that within six months, the whole of the trade creditors could receive 20s. in the £. If the creditors agreed to a scheme a claim for £10,000 would be withdrawn until the other liabilities had been paid in full. The creditors agreed that the business should be continued. It was decided that, subject to the claim of £10,000 being withdrawn, the business should be turned into a limited company, and first debentures carrying interest of not less than 6 per cent. per annum, issued to the creditors, and secured by a deed to Mr. Cork as trustee on behalf of the creditors. A committee of inspection was appointed, consisting of the representatives of Messrs. Pitchford & Thomas, Ltd., W. & H. Gidden, Ltd., Electron Co., Ltd., the Grosvenor Battery Co., Ltd., H. Bowyer & Co., E. Doherty, and the General Electric Co., Ltd. The conduct of the business will not be affected in any way by the execution of the deed. The latter discloses total liabilities of £29,390, against assets of £37,029. The following are creditors for more than £100:—

	£		£
Pitchford & Thomas, Ltd.	3,871	Danipad Rubber Co., Ltd.	787
Ripaults, Ltd.	357	Electron Co., Ltd. ...	2,235
Stevens, A. J., & Co.	856	Ericsson Telephones, Ltd.	236
Smith, J., & Co. ...	152	Grosvenor Battery Co., Ltd.	1,750
Trelleborg Ebonite Works, Ltd.	145	Gidden, W. & H., Ltd.	3,743
Wright & Weaire, Ltd.	467	Gambrell Bros., Ltd. ...	363
Williams & Moffatt, Ltd.	1,121	General Electric Co., Ltd.	957
Barclays Bank, Ltd. ...	286	Gabriel, Wade & English, Ltd.	100
Midland Bank, Ltd. ...	3,709	Great Western Rly. ...	54
Trustcott, J. S.... ...	125	Igranic Electric Co., Ltd.	173
Bowyer, H. & Co. ...	1,693	London Electric Wire Co.	106
Borst, C., & Sons ...	372		
Certax, Ltd.	1,012		
Doherty, E.	1,400		
Dubilier Condenser Co.	190		

New French Companies.

Among the new companies recently formed in France are the Société des Forces Motrices d'Arrens, Paris (5, Avenue Percier), capital two million francs; La Société l'Electro-Groupement, 10, Rue de la Fidelité, Paris, capital one million francs. La Société Normande d'Electricité Rurale, capital of three million francs, to extend electricity supply to rural areas in Normandy; and La Société pour l'Etude des Interconnexions Electriques de la Région Lyonnaise, in Lyons (49, Rue de la Bourse), capital of 300,000 fr., to prepare plans for the linking-up of the various electricity distribution undertakings in the Lyons district.

Unemployment.

There was a further increase (4,670) in the number of registered unemployed during the week ended September 3rd. At that date the total was 1,324,700, as compared with 1,320,030 on August 27th and 1,074,620 on September 5th, 1927.

For Sale.

Rochdale Corporation electricity department has for disposal one 3,000-kVA B.E.T. Co. transformer. (See our advertisement pages to-day.)

British Shares and the New York "Curb" Market.

In connection with the reports that the shares of the Ever-Ready Co. (Great Britain), Ltd., may shortly be listed on the New York "Curb" market, the *Financial Times* says that it is informed officially that a request that they should be so listed was received by the Ever-Ready Company, but that no action in the matter on the company's part has been taken. "New York's constant efforts to secure additional industrial counters with a view to speculation is a policy that does not meet with the Ever-Ready Company's favour."

Trade Announcements.

The Bury (Lancs.) Lighting & Heating Co., Ltd., electrical engineers and contractors, 9, Crostons Road, have opened additional premises at 47, Stanley Street, Bury.

Messrs. Ernest L. Tappin & Son, electrical engineers, Lewes, are shortly removing to new premises at 20, Fisher Street.

Kent Brothers Electric Wire Co. & E. H. Phillips, Ltd., announce that they have appointed Messrs. James Craig & Co., 200, St. Vincent Street, Glasgow, C.2, as their sole representatives for Scotland.

Burn Transmissions, Ltd., Longparish, Hants, has recently acquired new shops and installed special plant for the manufacture of the "Burn" transmissions, under the supervision of the inventor, Mr. Lewis Burn. Inquiries should in future be sent to the new address or to Clutha House, 10, Princes Street, Westminster, S.W.1.

The offices of the Atlas Light & Power Co., Ltd., have been removed to River Plate House, South Place, E.C.2. (Telephone: London Wall 9690.)

Messrs. Graham & Canon, electrical contractors, who have opened new offices and showrooms at 10, New College Parade, Finchley Road, Hampstead, N.W.3 (Telephone No.: "Primrose Hill 0848"), ask for copies of catalogues.

The business of British Patents & Imports has been wholly acquired by Electroservice, Ltd., 3, Waterloo Road, S.E.1.

Book Notices.

"Matter, Electricity, Energy," by W. Gerlach and F. J. Fuchs. Pp. xii+427; figs. 119. London: Chapman & Hall, Ltd. Price 30s. net.

"The Wireless Manual," by Capt. Jack Frost, I.A. (ret.). Pp. 220; figs. 102. London: Sir Isaac Pitman & Sons, Ltd. Price 5s. net.

A Bibliography of Electricity has been issued by the British Electrical Development Association, Inc., containing a selected list of books on electrical subjects. It may be obtained from the Association, price 2d.

"Electrical Sub-stations," by H. Brazil. Pp. vii+215; figs. 92. London: Edward Arnold & Co. Price 12s. 6d. net.

Publications of the British Cast Iron Research Association.—Index to Bulletin Nos. 1-20, January, 1923, to April, 1928.

"Past and Future Developments of Electricity." By H. G. Massingham. London: Hutchinson & Co. (Publishers), Ltd. Price 6d. net.

"*Journal* of the Institution of Electrical Engineers." Vol. LXVI. September, 1928. London: E. & F. N. Spon, Ltd. Price 10s. 6d.

New Catalogues and Lists.

Kye Electrical, Ltd., 1-3, Brixton Road, S.W.9.—An illustrated folder containing prices of various patterns of "Kye" British-made lamps.

Higgs Motors, Witton, Birmingham.—A stock list (priced) of a.c. and d.c. motors.

Messrs. Fescol, Ltd., 101, Grosvenor Road, S.W.1.—Brochure No. 17, giving useful information on the "Fescol" process of electro-plating for rebuilding worn mechanical parts, and for protection against erosion and corrosion.

Messrs. Charles Joyner & Co., Icknield Square, Birmingham.—Pamphlet describing "Angelus" immersion heaters and giving general data concerning immersion heaters.

MR. W. H. PETTIFOR, 11, Victoria Street, S.W.1.—A price list of electrical and mechanical aids for the deaf.

MESSRS. BLACKSTONE & Co., LTD., Stamford.—An illustrated booklet (Publication No. 443) dealing with the company's small petrol engines.

THE CARRINGTON MANUFACTURING CO., LTD., Sanderstead Road, South Croydon.—An illustrated and priced catalogue of wooden cabinets for radio sets, loud speakers, &c.

MESSRS. L. G. HAWKINS & Co., LTD., 30-35, Drury Lane, W.C.2.—A series of illustrated pamphlets describing the washing machines, ironers, "Vio-Ray" apparatus, sprayers, lighting fittings, &c., supplied by the company.

THE CONSOLIDATED PNEUMATIC TOOL CO., LTD., 170, Piccadilly, W.1.—Two illustrated leaflets advertising the company's portable electric drills and tappers.

SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD., 38-39, Upper Thames Street, E.C.4.—Illustrated general price sheet for September, and Catalogue No. 196, describing, with illustrations, the company's lighting glassware.

MESSRS. BELLING & Co., Bridge Works, Southbury Road, Enfield.—Fire catalogue for the 1928-29 season. Fully illustrated and priced.

MESSRS. KORTING & MATHIESEN ELECTRICAL, LTD., 711 & 715, Fulham Road, S.W.6.—Three illustrated price lists dealing, respectively, with "Kandem" daylight fittings, one-piece units for commercial lighting, and printing arc lamps.

THE TYPERLITE CO., 86, Cannon Street, E.C.4.—A booklet containing illustrated particulars of the firm's adjustable lamps. Priced.

The Timber Trade.

Our Timber Trade Correspondent reports that the spot market for European building woods has been brisk during the holidays, and is quite up to that of the active season of 1927. Stocks are now wearing down, as imports have been light, the market strengthening, although not yet to the level of shippers' ideas. The firmness of Swedish and Finnish exporters still prevents any considerable forward business, and as the season is now drawing to its close some move will have to be made for winter requirements, otherwise the country will be caught short of building woods in some six months' time. The hardwood section of the trade is very firm for the better grades (especially mahogany), but American supplies are still large, with demand dull and spot values weak. As States shippers, however, have raised their c.i.f. quotations, this section of the market is likely to firm up as merchants' stocks decline.

Recent Contracts.

Messrs. HARCOURTS, LTD., a subsidiary company of METROVICK SUPPLIES, LTD., whose premises have been recently extended, state that in spite of this extra accommodation they are fully occupied. Recent orders include special fittings for the Theatre Royal, Bolton; St. Joseph's Church, Heywood, Lancs.; St. Joseph's College, Upholland, Lancs.; Empire Theatre, Leicester Square, London; Rialto Cinema, Coventry Street, London; and the Cutlers' Hall, Sheffield.

The GENERAL ELECTRIC CO., LTD., has received an order from the Exeter Corporation Tramways for four complete tramcar electrical equipments. Each car will be equipped with two motors rated at 50 h.p. (500 V) on the one-hour rating, and two series-parallel controllers.

An Anglo-Scottish Golf Match.

At the invitation of the Edinburgh electrical men ("Jocks") per Mr. Walter Finlay, the Newcastle electrical men ("Geordies") were the guests of the Scotsmen at Goswick Golf course on the Border, on September 12th. This was a return invitation to one last year when the Newcastle team beat Edinburgh. This year the match was halved. The day was most fine and everyone had a splendid outing; the "Jocks" had chartered a charabanc and came all together from Edinburgh. After an excellent lunch play began at 1.0 p.m. Each party brought 13 players, six games were won by the Scotsmen, six by the Englishmen, and one was halved. The Scotch players were Messrs. Edgar, Shand, Hill, Nairns, Finlay, Whitely, Pratt, Junr., Pratt, Senr., E. Pratt (Leith), J. J. Foggo, Anderson, and Anderson-Begg. The English players were Messrs. Hugh Patterson, S. Pike, W. Casebourne, K. Wardroper, Devereaux, H. Turner, P. Gibson, Mearns, Tong, Barker, Evans, and Bradford. After the match the golfers had tea and after a few more games a vote of thanks to the Scotsmen was proposed by Mr. Tenant and replied to by Mr. Finlay.

United States Customs Decisions.

Among the recent rulings of the United States Customs Court, according to the *Board of Trade Journal*, are the following: Electrical mechanism constructed and designed to regulate economically the combustion of fuel by determining the percentage of carbon-dioxide in flue gas is dutiable under para. 372—30 per cent. *ad valorem*; and turbine steam engines for electric power plant are dutiable under the provision in para. 372 of the Tariff Act for steam engines, even though they are imported with the particular electrical machinery for which they furnish motive power—15 per cent. *ad valorem*.

The World's Aluminium Production.

The statistics annually issued by the Metal Company of Frankfort-on-Main in relation to non-ferrous metal production throughout the world have just been published for the year 1927. The world output of aluminium in 1913 is put at 65 million kg., and the consumption at 66 millions; in 1926 the figures were 202 millions and 187 millions, and in 1927 206 millions and 181 millions, respectively. The share of 54.6 per cent. of the world's output held by Europe in 1924-26 is said to have declined to 52.2 per cent. last year, whereas the proportion of the United States and Canada is stated to have risen from 45.4 per cent. to 47.5 per cent. On the other hand the consumption in Europe has advanced from 43.8 per cent. to 48.1 per cent., whereas in the United States and Canada it has declined from 56.2 per cent. to 51.9 per cent. For the first time statistics of the output of bauxite are embodied in the tables. These show that the world's production rose from 549 million kg. in 1913, to 1,298 millions in 1926, and to 1,643 million kg. in 1927.

Malayan Electrical Imports.

The *Board of Trade Journal* shows that during the March quarter British Malaya imported electrical goods and apparatus valued at £244,666, as compared with £124,998 during the first quarter of 1927.

Prices of Materials.

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, &c.	Price Sept. 18th.	Fortnight's inc. or dec.
a	Acid, Oxalic ... ... per lb.	5¾d.	...
a	Ammoniac, Sal ... ... per ton.	£60	...
a	Ammonia, Muriate (large crystal) ,,	£52	...
a	Bisulphide of Carbon ... ... ,,	...	...
a	Borax ... ... ,,	£25	...
a	Copper Sulphate ... ... ,,	£25 10s.	...
a	Potash, Chlorate ... ... per lb.	3½d. to 4d.	...
a	,, Perchlorate ... ... ,,	5½d.	...
a	Shellac ... ... per cwt.	£18 10s.	...
a	Sulphur, Commercial ... ... ,,	£11	...
a	,, Roll ... ... ,,	£11	...
a	Soda, Chlorate ... . per lb.	3d.	...
a	,, Crystals ... ... per ton.	£5 to £6 5s.	...
a	Sodium Bichromate, casks ... per lb.	3½d.	...
	METALS, &c.		
b	Aluminium, Ingots ... ... per ton.	£95 to £100	...
b	,, Wire ... . per lb.	1/8 to 1/9	...
b	,, Sheet ... ... ,,	1/8 to 2/9	...
p	Babbitts Metal and Anti-friction Metal—		
	Grade I ... ... per ton net.	£194	£1 inc.
	Grade II ... ... ,, ,,	£135	...
	Grade III ... ... ,, ,,	£78	...
c	Brass (rolled metal 2' to 12' basis) per lb.	9¾d.	...
c	,, Tubes (solid drawn) ... ... ,,	11¾d. to 1/-	...
c	,, Wire, basis ... ... ,,	9¼d.	...
c	Copper Tubes (solid drawn) ... ,,	1/1½	...
c	,, Bars (best selected) ... per ton.	£94	...
c	,, Sheet ... ... ,,	£94	...
c	,, Rod ... ... ,,	£94	...
d	,, (Electrolytic) Bars ... ... ,,	£70 15s.	30s. inc.
d	,, ,, Sheets ... ... ,,	£143 10s.	
d	,, ,, Wire Rods ... ,,	£60 15s.	30s. inc.
d	,, ,, H.C. Wire per lb.	1s.½d.	¼d. inc.
f	Ebonite Rod ... ... ,,	2/8 to 2/6	...
f	,, Sheet ... ... ,,	2/8 to 2/6	...
n	German Silver Wire ... ... ,,	2/2	...
h	Gutta-percha, fine ... ... ,,	nom.	
h	India rubber, Para fine ... ... ,,	10¼d.	¼d. dec.
l	Iron Pig (Cleveland No. 3.) ... per ton.	65/-	...
l	,, Wire, galv. No. 8, P.O. qual. ,,	£21	
g	Lead, English pig ... ... ,,	£23 5s.	10s. dec.
g	Mercury ... ... per bot.	£23 15s. to £24	10s. to 15s. inc.
e	Mica (in original cases) small ... per lb.	3d. to 3/-	...
e	,, ,, medium ,,	4/- to 8/-	...
e	,, ,, large ... ,,	10/- to 20/- & up	...
p	Phosphor Bronze, plane castings ,,	1/3½	...
p	,, ,, drawn bars & rods ,,	1/8	...
p	,, ,, rolled strip & sheet ,,	1/9½	...
p	,, ,, wire... ... ... ,,	1/8½	...
e	Platinum ... ... per oz.	£17 15s.	...
d	Silicium Bronze Wire ... ... per lb.	10½d.	...
r	Steel, Magnet, in bars ... ... ,,	7½d.	...
n	Tin, Block (English) ... ... per ton.	£214 to £215	30s. to £2 inc
n	,, Wire, Nos. 1 to 16 ... ... per lb.	3/8	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Reporting on the lead market under date September 15th, Messrs. James Forster & Co. stated:—"Demand from consumers has quietened down this week, what orders there are being filled by delivery from warehouses, as no steamers are arriving. Contrary to expectation, the strike of waterside workers in Australia has had no effect on prices so far, probably because there are ample supplies of lead afloat, but if the strike is protracted, the effect is bound to be felt sooner or later. Another feature affecting the future is the meeting next week of leading producers, when it is rumoured there will be a discussion of 5 per cent. cut in production. This, if decided upon, will, of course, mean higher prices temporarily, but we rather anticipate that things will be left as they are so long as the present price prevails." The meeting referred to by Messrs. Forster was held on September 17th, but no statement was issued.

Further Lamp Propaganda.

The TUNGSRAM ELECTRIC LAMP WORKS (GREAT BRITAIN), LTD., has sent us samples of showcards and cut-outs which it is providing to retailers of "Tungsram" lamps for the 1928-29 lighting season. These are very effective and original. A notable feature of the company's propaganda is its circular system. There are over 300,000 people on the mailing list, and each of these receives something like twelve reminders in the course of the year. The circulars are backed up by judicious public, technical and trade advertising, and a strong "sales force."

New Works at Stourport.

A correspondent states that plans are being carried out for a new industry (Steatite & Porcelain Products, Ltd.) at Stourport, Worcestershire, for the manufacture of steatite insulators, which have hitherto been made in Germany. A contract for constructional steel has been placed with Messrs. Braithwaite, of West Bromwich, and Messrs. T. Vale & Co., of Stourport, will erect the works.

Lighting and Power Notes.

Aberdeen.—YEAR'S WORKING.—The revenue and expenditure account for the electricity undertaking (engineer and manager, Mr. J. Alex. Bell, M.I.E.E.), for the year ended March 31st last shows a total income of £229,312, as compared with £230,201 for the preceding year, and total working expenses of £105,287, against £131,006 for 1926-7, leaving £124,025 (£99,195) for transfer to the net revenue account. This shows a profit of £6,381 after the deduction of the capital expenses. The capital account now shows a total expenditure of £1,442,870, of which £123,231 was spent during the year, including £77,047 on machinery and £29,248 on mains. The units generated and sold during the year amounted to 3,106,470 and 2,820,349, respectively, representing increases of 8.40 and 9.35 per cent. on the figures for the preceding year. The coal cost of 0.252d. per unit sold represents a record for the department.

Altrincham.—PRICE REDUCTION.—The Altrincham Electric Supply Co., Ltd., has decided to reduce its charge for electricity and lighting by 1d. per unit as from the readings for the December quarter.

Blackburn.—LOAN.—The Town Council has decided to apply for a loan of £14,500 to meet the cost of two schemes for the supply and distribution of electricity to the Yew Tree Erow and Arterial Road districts.

Bradford.—NEW CABLE.—The Corporation Electricity Committee has decided to lay a new direct-current feeder from Sunbridge Road sub-station to Southgate, at an estimated cost of £7,300.

Bristol.—YEAR'S WORKING.—We have received from Mr. H. Faraday Proctor, M.I.E.E., chief engineer and general manager, a copy of the annual report and statement of accounts of the electricity undertaking for the year ended March 31st last. The total income for the year was £536,910, as compared with £519,857 for the previous year. The working expenses amounted to £261,165, as against £334,925 for 1926-7, leaving a gross profit of £275,745, against £184,932. After deducting the capital expenses for the year there remains a net profit of £117,990, as compared with £58,396 for the preceding year. The total capital expenditure on the undertaking for the year amounted to £998,347, of which £103,475 was spent on buildings, £139,051 on culverts, £289,843 on machinery, and £185,256 on mains. The units sold during the year amounted to 84,123,978, and the maximum load on the undertaking was 38,363 kVA. The load factor was 28.98 per cent. The plant capacity at the end of the year was 49,390 kVA. Coal consumption for the period under review works out at 2.48 lb. per kWh sold, the cost being 0.21d.

Carlisle.—MAINS EXTENSIONS.—The Electricity Committee has approved a scheme of mains extensions estimated to cost £2,213.

Colchester.—PRICE REDUCTIONS.—The City Council has adopted the following new scale of charges for large power consumers with a consumption of above 150 units per quarter: First 2,000 units per quarter, 1½d. per unit; beyond, 1¼d. per unit. Lighting not exceeding 25 per cent. of the total consumption will be included at the same rates when over 50,000 units per annum is consumed. Alternative two-part tariff to consumers not less than 10 kVA, *viz.*, charge per kVA, £4 10s. per annum, plus a unit charge varying from 0.6d. to 0.5d. Lighting not exceeding 25 per cent. of the total load is to be included in these rates.

Clacton.—LOAN.—The Electricity Committee is to apply for sanction to borrow £8,550 for mains, services and meters.

Continental.—AUSTRIA.—Work is in hand at the works of the Austrian Siemens-Schuckert Co. in Vienna on the construction of two 30,000-kVA alternators for the Vermunt power station of the Vorarlberger Illwerken Co., of Bregenz. The generators are stated to be the largest so far manufactured in Austria.

ITALY.—The construction of a large dam has lately been started at Barbellino, near Bergamo, in connection with a new hydro-electric generating scheme. The dam, which will be 656 ft. in length and 229 ft. high, will form an artificial lake capable of storing over 3,960 million gallons of water.

SWEDEN.—Vattenfallsstyrelsen (Waterfalls Board) is asking the Government to propose an allocation of Kr.6,550,000 for investment in hydro-electric power works belonging to the State. Out of this amount Kr.3,000,000 would be used for the development of the distribution systems.

Crawley.—INQUIRY.—The Ministry of Transport has granted the application of electricity consumers in Crawley and district for a public inquiry into the charges made by the Sussex Electricity Supply Co., Ltd. Col. T. C. Ekin will open the inquiry on October 16th.

Derby.—NEW PLANT.—The Town Council has received permission to install a 20,000-kW set and two boilers, instead of only a 10,000-kW set and one boiler.

Doncaster.—LOAN.—The Electricity Committee has been granted permission to borrow £51,370 for switchgear, mains, sub-station and other equipment.

Douglas (I. of M.).—BULK SUPPLY.—At a recent meeting of the Electricity Committee, the electrical engineer reported that he had been informed that the General Electric Co., Ltd., intended applying for distributing powers for the whole island, excluding the area covered by the Douglas Electric Light and Power Act, purchasing electricity in bulk from the Douglas undertaking.

The Committee has purchased land at Summer Hill for the purpose of erecting a rectifier sub-station.

Dudley.—MAINS EXTENSIONS.—The Shropshire, Worcestershire and Staffordshire Electric Power Co. is to lay cables in Dibdale Street, Castle Hill Road, Churchfield Street, St. John's Street, Netherton and Oakham Road.

Forfar.—ELECTRICITY SUPPLY.—The Grampian Electricity Supply Co. proposes to acquire land in the burgh for the purpose of erecting transformer stations.

Grays.—LOAN.—The Urban Council has received sanction to a loan of £2,350 for the provision of an electricity showroom.

Grampian Scheme.—LOCHS ERICHT AND RANNOCH.—Mr. George Balfour, M.P., of Messrs. Balfour, Beatty & Co., Ltd., on September 12th fired the first shot in the heading of the tunnel connecting to two lochs in connection with the Grampian electric scheme which is being embarked upon by the Scottish Power Company.

ACCOMMODATION FOR WORKERS.—A wooden township has sprung up on a bleak Grampians mountain side at Kinloch Rannoch, Perthshire. It will house several hundreds of the large number of workmen who have commenced to harness 40 miles of rivers and lochs for the development of hydro-electric energy.

Harrogate.—UNDERTAKING PURCHASE.—The purchase price of the Knaresborough electricity undertaking has been fixed at £12,805.

Hastings.—LOAN.—The Electricity Committee has obtained sanction to borrow £10,000 for house services.

Huntly.—ELECTRICITY SCHEME.—The Town Council of Huntly (Aberdeenshire) has appointed a committee for the purpose of considering the feasibility of an electric scheme for the burgh.

Japan.—NEW POWER STATION.—The Hiroshima Electric Company has prepared the preliminary plans for an automatically operated power station of 30,000-kW capacity.

Kirkcaldy.—ELECTRICITY SCHEME.—In connection with the burgh's new electricity scheme the recommendations in a report from Messrs. Kennedy & Donkin have been approved by the Council.

Lowestoft.—BULK SUPPLY.—The bulk supply to the town from Great Yarmouth was inaugurated on September 12th.

North Wales.—NEW HYDRO-ELECTRIC WORKS.—Colonel W. Ashley, M.P., Minister of Transport, will perform the opening ceremony of the North Wales Power Company's new hydro-electric station at Maentwrog, Merionethshire, on October 15th. From this station towns in the Wrexham and South Cheshire districts will be supplied with electricity. A curved dam, 400 ft. across and 100 ft. high, which has taken over two years to construct, has been erected across the Maentwrog Valley to conserve the water, which is conveyed to the works in pipes.

Nottingham.—NEW SET.—Work is being rapidly completed in connection with the installation of a new 20,000-kW set at the North Wilford generating station. It is expected that the opening ceremony will be performed by Sir Andrew Duncan, chairman of the Central Electricity Board, early in November

Oldham.—LOAN.—The Corporation Electricity Committee has obtained sanction to borrow a further sum of £78,872 in respect of expenditure on the new generating station.

Peterhead.—NEW POWER STATION.—The Peterhead Electricity Co., Ltd., has been authorised by the Town Council to erect a new electric power station in Ugie Street.

Special Orders.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them empowering the West Cornwall Electricity Supply Co., Ltd., to supply electricity in the boroughs of Helston, St. Ives and Penryn and a number of urban districts in Cornwall; and an Order giving the Cranleigh Gas & Electricity Co., Ltd., powers to supply in the parish of Ewhurst (rural district of Hambledon), Surrey.

Taunton.—YEAR'S WORKING.—After meeting all expenses, including interest and sinking fund, the profit on the working of the undertaking for the year ended March 31st last was £4,967. Having regard to the small output of the undertaking, 2,525,753 kWh, and the high price at Taunton for coal, 26s. per ton, the borough electrical engineer, Mr. Arch. J. Howard, A.M.I.E.E., claims that the electricity supply in the town is the cheapest in Great Britain, and also that the coal consumption per unit sold is the lowest in the world, for undertakings of similar output and load. The prices are to be reduced from the September readings as follows: Lighting from 5d.—3d. per unit (according to consumption), to 4½d.—2½d. per unit; cooking and heating, from 1d. to ¾d. per unit for the June and September quarters; power, from 2d.-1d. per unit (according to consumption) to 1½d.-1d. per unit.

Thornaby.—OVERHEAD LINES.—The Town Council is protesting against the attitude of the Cleveland and Durham County Electrical Power Company in insisting upon erecting overhead gear in the street in connection with the introduction of electricity into the borough.

Wareham.—ELECTRICITY UNDERTAKING.—The Town Council has been informed that the undertaking of the Wareham Electricity Supply Co. has been taken over by the Bournemouth and Poole Electricity Supply Co., Ltd., and Mr. Field has been retained as engineer to the undertaking.

Weymouth.—YEAR'S WORKING.—The statement of accounts for the year's working of the undertaking (engineer, Mr. George Nicolson, A.M.I.E.E.), ended March 31st last, shows a total income of £31,408, as against £33,307 for the previous year. The working expenses amounted to £18,700, as compared with £23,475, leaving a gross profit of £12,708 (£9,832). The net revenue account shows that after the deduction of capital expenses there is a profit of £4,976, as against £4,232 for the preceding year. The capital expenditure during the year amounted to £37,947, which brought the total capital expenditure on the undertaking up to £160,895; £26,940 was spent on machinery, and £5,452 on mains. The maximum load on the station during the year was 1,265 kW, the total number of units sold 2,193,475, and the load factor 25.5 per cent.

MAINS EXTENSION.—The Electricity Committee has decided to extend the mains to the Weymouth Bay Estate at a cost of £3,500.

Tramway and Railway Notes.

Australia.—NEW SOUTH WALES.—The State Cabinet has decided to remove the control of the New South Wales tramways from the Railway Commissioners to a new authority.

BRISBANE.—Application is being made by the City Council for authority to borrow £250,000 for tramway purposes.

Bradford.—LOAN.—The Corporation Tramways Committee is to seek sanction to borrow £29,560 for the purpose of equipping the Allerton section as a railless vehicle route, and also to borrow £28,220 for similarly equipping the permanent-way from Five Lane Ends to Thackley.

Continental.—BELGIUM.—The Société Nationale des Chemins de Fer Vicinaux is preparing plans for the electrification of the steam local railway between Antwerp and Burght, and also the Polders line.

FINLAND.—The State Committee for the electrification of the railways has decided to complete the programme in the current year. The acceleration of the work is ascribed to the fact that the large generating station at the Imatra Falls will shortly be completed. The sections of the railways which will first come under consideration for electrification are Helsingfors-Wiborg, Tammerfors-Helsingfors and Abo-Helsingfors.

ITALY.—A contract has lately been placed by the Italian State Railway authorities with the Società Technomasio Italiana Brown-Boveri, of Milan, for thirty 2,000-h.p. electric locomotives operating on 3,300-V three-phase supply.

Salford.—FIRE.—The Corporation tramway offices, a six-storey building in Blackfriars Street, were destroyed by fire on Monday last. All the tramway records were destroyed and a stack of several million tickets was also burned.

Southend.—TRAIN COLLISION.—On September 14th two electric trains collided on Southend Pier. One, travelling from the land end of the pier, struck the last two cars of one leaving the pier-head, which had not cleared the points on a loop line.

Sunderland.—EXTENSION OF TRACK.—The Town Council has decided to extend the Durham Road to the Humbleton suburb, at an estimated cost of £19,326.

Telegraph and Telephone Notes.

France.—"TELETYPE" SERVICE.—A new regulation has lately been issued by the French Postal and Telegraph Authorities under which subscribers to the telephone service throughout France are to be permitted to install teletype apparatus in connection with their instruments to enable telegraph communications to be transmitted to other subscribers, or to the telephoned telegram section of the French Telegraph Department.

International Telegraph Congress.—TARIFFS.—At the September 14th meeting of the International Telegraph Congress at Brussels, the leader of the German delegation, Herr Arendt, read a report on the labours of the Commission which had been entrusted with the work of drawing to the attention of customers the difficulties in the present system of making known their wishes, and of discovering means whereby those difficulties might be overcome. During the discussion the representative of the International Chamber of Commerce, Sir John Sandeman Allen, M.P., said that the latter body was not opposed to all changes, but could not consent to any increase in the cost of telegrams. The Congress then discussed the proposal of the Committee at Cortina for a uniform tariff at lower rates for clear and code words, the charge proposed being 66 per cent. of the full rate in zones other than European and 90 per cent. in the European zone. The delegation of the United States of America opposed any change in the present system, and those of Great Britain and Canada objected to any increase in charges. As an undertaking was not given that charges would not be increased, the delegates from the International Chamber of Commerce withdrew from the Congress. A representative of German industry enumerated the advantages of an application of the proposals of the Cortina Committee, and said that even if the cost of telegrams was increased by one half, it would be to the interest of German industry to support the change. A Swedish delegate then urged the merits of the system of code words with a maximum of six letters as used in the Scandinavian countries. The Conference has thus three proposals before it: First, that of the Cortina Committee, for the reduction of code words from ten to five letters, with a reduction in charges. Secondly, that of the British for no change. Thirdly, the Swedish proposal for code words of six letters. The Conference therefore decided that a Committee should examine the various proposals and report upon them.—*Reuter* (Brussels).

Maritime Wireless Associations.—CONFERENCE IN SPAIN.—A conference of wireless maritime associations representing the principal wireless maritime companies of the world, was held last week at San Sebastian, Spain. An international radio maritime committee was formed, consisting of representatives of the following companies: The Marconi International Marine Communication Co., Ltd., England; Radio Communication Co., Ltd., England; Deutsche Betriebsgesellschaft fur Drahtlose Telegraphie m.b.H., Germany; Hispano Radio Maritime, Spain; Compagnie Radio Maritime, France; Societe Anonyme Internationale de T.S.F., Belgium; Nederlandsche Telegraaf Maatschappij, "Radio-Holland," Holland; Radiomarine Corporation of America; Societa Italiana Radio Marittima, Italy; Norsk Marconikompani, Norway. The purpose of the committee is to pool the experience and specialised knowledge of wireless companies for the benefit of shipowners, passengers, and the public generally, and to aid all those who are interested in the development and use of wireless at sea. Mr. A. Hubert, managing director of the Belgian company, was elected president of the new committee, and Mr. F. S. Hayburn, general manager of the Marconi International Marine Communication Co., Ltd., was elected vice-president.

Northern Ireland.—TELEPHONE SERVICE.—Statistics have been issued by the district manager of Post Office telephones in Belfast, showing that since the beginning of the present year 1,100 new subscribers have been connected, while 26 additional trunk circuits have been provided. Five new telephone exchanges have been established, *viz.*, at Newtownbutler, Garvagh, Killyleagh, Lisnakea, and Richill. Extensions of ex-

changes have been completed at 14 towns, whilst the provision of new exchanges is in hand at Annaghmore, Clogher, Crossmaglen, Fivemiletown, Saintfield, and Sion Mills. Additional public telephone street kiosks have been provided to the number of 39, and the provision of 18 more is in hand; rural call offices are being established at Ballynure and Straid.

Portuguese East Africa.—LOURENCO MARQUES.—In the course of a report upon conditions in Portuguese East Africa (reproduced in the *Board of Trade Journal*), Mr. Joseph Pyke, British Consul-General at Lourenço Marques, says that a steady increase in the telephone service is taking place, there being about 700 telephones in the district of Lourenço Marques, and the land telegraph service is maintained in an efficient state. Development in this direction is, however, rather by way of extension of the wireless system. The towns of Chai Chai (Vila de Jono Belo) and Porto Amelia are being equipped with Marconi plant, and the station at Tete is on the point of being opened for communication within the Colony. A powerful beam station was opened at Lourenço Marques early last year, and the results secured would appear to have exceeded the hopes of the promoters of the enterprise; business with Europe has even been obtained in the Union of South Africa.

Scientific Union.—EXPERIMENTAL CENTRE.—A meeting of the International Scientific Radio Union is being held in Brussels to consider means of accelerating the advancement of practical applications of radio-electrical science. On the initiative of Mr. Robert Goldschmidt, the Belgian Secretary-General of the Union, who contributed 200,000 fr. (£1,140) as a first gift, says *The Times*, it has been decided to establish in Brussels a radio-telegraph experimental centre.

Sweden.—COMMUNICATIONS EXTENSIONS.—The Government Telegraph and Telephone Department, in its preliminary budget plan for 1929-30, calls on the treasury for a sum of 8,618,593 kronor, of which 7,000,000 kr. is for the further extension and development of the telephone and telegraph systems. The Department plans the building of new broadcasting stations at a cost of 1,200,000 kr., and the broadcasting stations of Stockholm and Sundsvall will be rebuilt. A new submarine telephone cable will be laid to the island of Gotland in the Baltic at a cost of 1,300,000 kr., and the new telephone connection with Finland will be opened for traffic early next year.

Switzerland.—LEAGUE OF NATIONS RADIO STATION.—The Third (Reduction of Armaments) Committee has had before it the question of the League wireless station, which is considered by some nations as part of the machinery of security. However, says *The Times*, Mr. Cadogan, the British delegate, not only stated that Great Britain considered the cost of a purely League station to be altogether out of proportion to its possible utility, but that it did not agree with the Swiss Government's proposal to build a Swiss station, to be at the disposal of the League in time of crisis. The British Government was not sure that wireless was the most suitable form of transmission for the League, and, in any case, it did not think the League was justified in so adding to its financial commitments. The moment was not opportune for expenditure of that character.

Radio Notes.

Germany.—LICENCES.—In the last quarter there was a great diminution in the number of convictions of "pirates" in Germany, says *World-Radio*, the total falling to 331, as compared with 1,003 for the corresponding period in 1927. Licence holders are approaching the two and a half million mark, and blind licensees (who, as in England, are allowed free licences) now number 15,629.

U.S.A.—NEW STATIONS.—Permits for the construction of two radio transmitting stations of 10,000 watts each, one in New York and the other in Chicago, and licences for experimental operation on three short-wave channels have been granted to the Universal Wireless Communication Company by the Federal Radio Commission as the first step in a plan to set up a national radio communication network as a public utility. According to the *T. & T. Age*, politicians who have been declaring that to "just own or hire a radio broadcasting station and bawl them out" was all that would be necessary in the political campaigns this Fall, will be interested in the Federal Radio Commission's first decision on a matter of that kind, ordering station WCOT, of Providence, R.I., operated by Mr. Jacob Conn, to "go off the air" after September 1st. The decision is of national importance as laying down general principles which will govern the Commission's action in other similar cases.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Australia.—MELBOURNE.—Posts and Telegraphs Department. October 30th. Loading coil pots.

October 23rd. Insulated wire. (B.X. 4674.)*

October 26th. City Council. Totally enclosed metal-clad switchgear. (B.X. 4698.)*

November 13th. Switchboard keys and parts.*

VICTORIAN ELECTRICITY COMMISSION.—December 17th. Supply of metal-clad switchgear and accessories. (Spec. 28/68. £1 1s. for three copies.)

SYDNEY.—October 10th. N.S.W. Railways and Tramways. 2,200-V ironclad switchgear for Sefton sub-station. (Spec. 2s. 6d., from the Chief Electrical Engineer.) November 14th. Supply and erection of ash-sluicing equipment for Lithgow power station. (Spec. 819, 5s., from the Chief Electrical Engineer.)

Bedwas and Machen.—September 24th. Urban District Council. Overhead and underground mains. (September 7th.)

Bo'ness.—September 28th. West Lothian Education Authority. Electrical and heating engineers' work in connection with new Central School, Bo'ness. Specifications, &c. (deposit of one guinea) from Mr. E. Blades, executive officer, Education Offices, Bathgate.

Canada.—SASKATOON.—October 10th. Municipal Council. One 10,000-kW turbo-alternator, condenser and auxiliary equipment, or, alternatively, one 7,500-kW unit. (B.X. 4721.)*

Darlington.—October 15th. Electricity Department. Cooling tower. (See this issue.)

Edinburgh.—October 15th. Corporation. Coal and ash plant for Portobello power station. (September 7th.)

Egypt.—GIZA.—October 4th. Royal School of Engineering. Small tools, accessories for machine tools, and electrical plant. (B.X. 4703.)*

Ministry of the Interior. November 10th. Supply and installation of a distribution network for the village of Kena. (B.X. 4707.)*

India.—October 16th. India Store Department. Oil-engine-driven alternator sets and switchgear for Ahmednagar. (B.X. 4714.)*

October 11th. One push-button control passenger lift. (A.X. 6845.)*

October 11th. Two 150-kVA transformers. (See this issue.)

November 2nd. Three 75-kW oil engine alternator sets, water-cooling plant, tanks, switchboard cables, &c. (See this issue.)

October 17th. One water turbine and two oil-driven d.c. generating sets for the Mardan power station. (A.X. 4733.)*

Leeds.—September 29th. Electricity Department. Supply and erection of 3-phase switchgear at Kirkstall power station. (August 31st.)

London.—METROPOLITAN ASYLUMS BOARD.—October 3rd. Installation of automatic telephones at Princess Mary's Hospital. Installation of kinematograph at Darenth Training Colony. Wiring of outside supply at Colindale Hospital. (September 7th.)

SOUTHWARK.—October 23rd. Electricity Department. Electric cable for 12 months. (September 14th.)

ISLINGTON.—October 8th. Cleansing Committee. Two new lead batteries for refuse collecting vehicles. (See this issue.)

PADDINGTON.—October 9th. Great Western Railway. Stores, including telegraph instruments, electrical apparatus and electric lamps. (See this issue.)

New Zealand.—WELLINGTON.—November 27th. Public Works Department. Generators and water turbines, in connection with Section 1 of the Waitaki power scheme. (B.X. 4677.)*

Norwich.—October 8th. Electricity Department. 12,500-kW turbo-generator and condensing plant. (September 14th.)

Rumania.—CONSTANTZA.—Port Authority. October 1st. One electric portal crane and two goods lifts. (A.X. 6797.)*

St. Albans.—September 29th. Town Council. Installation of electric light at the Sisters' Infectious Hospital, Folly Mead. Mr. F. T. Negus, city engineer, 38, St. Peter's Street.

South Africa.—JOHANNESBURG.—Electricity Supply Commission. October 26th. Supply, delivery, and erection of equipment for a hydro-electric power station, Gordon's Bay hydro-electric scheme, and two outdoor sub-stations. Tenders may be submitted on any or all of the following sections:—(*a*) Waterwheels; (*b*) generators; (*c*) switchgear, relays, cables, &c.; (*d*) outdoor sub-station steel structure, switchgear and copper; (*e*) miscellaneous equipment, including precision instruments, small petrol-driven generator set, oil filter, &c.

November 9th. Posts and Telegraphs Department. Wall telephones for the Hillbrow exchange. (B.X. 4709.)*

November 15th. Dry cells and voltoids. (B.X. 4729.)*

November 8th. South African Railways and Harbours. Electrically-driven overhead travelling cranes for Pretoria and Pietermaritzburg workshops. (A.X. 6815.)*

SALISBURY (S. RHODESIA).—October 1st. Municipality. H.p. transmission line (10¼ miles), four 250-kVA transformers, centrifugal pumps, motors, switchgear, and crane.

Taunton.—September 27th. Electricity Department. One 2,000/3,000-kW turbo-generator with condensing plant, &c. (September 7th.)

Uruguay.—MONTEVIDEO.—State Electricity Supply Works. October 17th. Automatic voltage regulator. (B.X. 4699.)*

October 15th. Electricians' pliers and wire drawing machines. (B.X. 4702.)*

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Australia.—SYDNEY.—The N.S.W. railway authorities have accepted Messrs. Babcock & Wilcox's tender for six boilers for the Ultimo power house, at £261,000.—*Reuter* (Sydney).

Bedford.—Electricity Committee. Accepted:—
Cables for auxiliary motors.—Siemens Bros. & Co., Ltd.
Ammeters and current transformers for works sub-station.—British Thomson-Houston Co., Ltd.
Rotary feed pump (£260).—W. H. Allen, Sons & Co., Ltd.

Bradford.—Tramways Works Sub-Committee.
100 tons brake shoes (£860).—Yorkshire Repetition Castings Co., Ltd.
7,200 yards trolley wire (£428).—F. Smith & Co., Ltd.
Portable air compressor (£480).—Pneumatic Tool Co., Ltd.
Electricity Committee. Accepted:—
Radiant type superheater for boiler at Valley Road power station.—Foster, Wheeler, Ltd.
Steam valves.—J. Blakeborough & Sons, Ltd.

Buxton.—Electricity Committee. Accepted:—
H.p. switch panels and switchgear.—Mather & Platt, Ltd.
500-kW motor convertor with accessories and d.c. switchgear.—Mather & Platt, Ltd.
One 230-kW mercury arc rectifier, one 58-kW ditto.—Hewittic Electric Co., Ltd.
H.p. feeder cables.—Callender's Cable & Construction Co., Ltd.

Clacton.—Electricity Committee. Accepted:—
Equipment for St. Osyth Road sub-station (e.h.p. and l.p. switchgear (£641).—Crompton-Parkinson, Ltd.
Transformers (£180).—Fuller Electrical and Manufacturing Co.

Dublin.—Electricity Supply Board. Accepted:—
L.p. distribution networks for the greater Dublin area.—Callender's Cable & Construction Co., Ltd. This contract, with the one for the high-pressure feeders in the area, makes the total value of the contracts secured by Callender's Cable & Construction Co., Ltd., approximately £90,000.
Dublin United Tramways Co., Ltd. Accepted:—
Two miles Phono electric trolley wire.—Equipment and Engineering Co., Ltd.

Edinburgh.—Corporation Tramway Department. Accepted:—
Five miles Phono electric trolley wire.—Equipment and Engineering Co., Ltd.

Golborne.—Urban Council. Accepted:—
Installing electricity at 16 houses (£7 8s. 2d. per house).—Roberts Bros.

Hastings.—Electricity Committee. Accepted:—
Reinforced concrete cooling tank at power station (in lieu of tender withdrawn) (£2,495).—Peter Lynd & Co., Ltd.
2,200-V switchgear for ten sub-stations (£711).—Ferguson, Pailin, Ltd.
Steel framework for power station buildings (£100).—Pierson & Co., Ltd.

Kintore.—
Electrical work in connection with the third instalment of the housing scheme.—J. B. Reid (Aberdeen).

Lamp Contracts.—The GENERAL ELECTRIC CO., LTD., has received contracts for 12 months' supplies of electric lamps from the Southern Railway and the General Post Office.

London.—ST. PANCRAS.—Contracts and Stores Committee. One 15,000-kW steam turbine and alternator for the King's Road power station:—

	£	£
Oerlikon, Ltd.	30,724	
British Brown, Boveri, Ltd. ...	32,933	to 36,433
Fraser & Chalmers	42,311	to 49,092
Richardsons, Westgarth & Co., Ltd.	42,600	to 49,150
BRUSH ELECTRICAL ENGINEERING Co., LTD. (Recommended.) ...	42,760	
Metropolitan-Vickers Electrical Co., Ltd.	43,162	to 46,316
British Thomson-Houston Co., Ltd.	43,239	to 45,645
English Electric Co., Ltd.	43,980	
C. A. Parsons & Co., Ltd.	44,040	to 51,895

FULHAM.—Electricity Committee. Recommended:—
Electrical impulse clock outside new electricity showrooms (£95).—Synchronome Co., Ltd.

BERMONDSEY.—Electricity Committee. Accepted:—
L.p. cables (£1,973).—Siemens Bros. & Co., Ltd.
Stoneware ducts.—Roberts, Adlard & Co.

GREAT WESTERN RAILWAY. Accepted:—
Four electric capstans for The Mole, King's Dock, Swansea.—Ransomes & Rapier, Ltd.
One 50-ton overhead electric travelling crane for Old Oak Common.—S. H. Heywood & Co.

Truro.—Town Hall Committee. Recommended:—
Installation of electric lighting in the municipal buildings and clock tower (£157).—Hosken, Trevithick, Polkinhorn & Co., Ltd.

Walton-on-Thames.—Urban Council. Accepted:—
Feeder pillars (£486).—W. Lucy & Co., Ltd.
Transformers (£115).—Hackbridge Electric Construction Co., Ltd

Weymouth.—Electricity Committee. Recommended:—
Boiler-house extension (£2,533).—Jesty & Baker (in place of previous tender since withdrawn).
Chimney stack repairs (£209).—Frankland, Phillips & Co.
Cable work in connection with supply to borough sanatorium (schedule rates).—Johnson & Phillips, Ltd.

Forthcoming Events.

National Radio Exhibition.—September 22nd-29th. Olympia, W.

World Power Conference.—September 24th-October 6th. Imperial Institute, S.W.

Birmingham Electric Club—Friday, September 28th. Grand Hotel. 7 p.m. "Automatic Sub-stations." Mr. G. Rogers.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following:—

LAUN-DRY-ETTE electric clothes washer.
"THERMA" electric bowl fire.
"PYROFRAX" insulating material.

Notes.

A Cathedral Installation.

The accompanying illustration is reproduced from a photograph of the interior of St. Asaph Cathedral at night, showing the perfect diffusion of illumination obtained with electric lamps of 7,000 watts. The effect is achieved by indirect flood lighting through adjustable lenses and reflectors ("Blaizolite" patents). "Gecoray" lanterns were also installed in the side aisles. The installation was carried out under the direction of Mr. Vaughan Fowler, of London, and is the gift of Major Charles Williams, of Eryl, St. Asaph, in memory of his late wife. It is to be inaugurated on September 23rd.

Illumination of Interior of St. Asaph Cathedral.

Electricity Supply Report.

The Ministry of Transport has issued a report on its proceedings in connection with electricity supply during the year ended March 31st, 1928. Special Orders made by the Electricity Commissioners and confirmed by the Minister during that period numbered 75, and 17 others were awaiting confirmation on March 31st. Orders authorising revision of maximum prices were made in three cases, and two other cases were deferred. Powers to supply electricity were revoked in two instances. Consent was given for the erection of overhead lines by 41 authorities, and 96 applications for consent for wayleaves were dealt with, consent being given in 87 cases.

The Minister approved an estimate of the Electricity Commissioners of their receipts and expenditure during the year, the amount to be apportioned amongst authorised undertakers being £44,000, as compared with £51,000 for the previous year.

Three schemes were transmitted to the Central Electricity Board during the year.

The Commissioners gave their consent to the establishment of 15 new generating stations, 9 statutory and 6 non-statutory; to 65 applications for extensions; and to 64 applications for the establishment of main transmission lines. The aggregate capacity of the generating plant sanctioned during the year was 668,357 kW, of which 246,642 kW was to be installed in new stations.

During the year the Commissioners received 768 applications for sanction to loans, and 751 sanctions were issued, covering loans amounting to £18,140,062. They had 176 applications for Special Orders under consideration, and made Orders in 81 cases. In 30 cases arrangements for bulk supplies were approved, as well as six contracts for bulk supplies. Fringe Orders were made in 101 cases; special systems of supply were approved in 7 cases, and consent was given to change of system or pressure in 29 cases.

The Inspection of Factories.

The Home Secretary has appointed a Committee to consider what additions to the Factory Inspectorate are required, whether changes in its organisation are desirable, and what other measures can be taken to enable the Factory Department to discharge adequately its existing duties and the further duties foreshadowed by the Government's Factory Bill of 1926.

Overhead Lines Association.

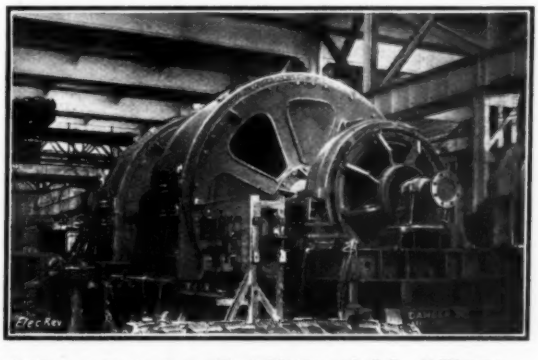
The Overhead Lines Association is holding a conversazione on October 10th, at Wellington Rooms, 105, Victoria Street, S.W.1. We understand that a limited amount of space is available for exhibits, and offers of exhibits of interest in connection with overhead lines will be allocated space in the order of their reception. Such exhibits are to be delivered on October 10th and reclaimed early on October 11th.

France's New High School of Electricity.

The Société Francaise des Electriciens has recently issued a reprint of the speeches made on the occasion of the official opening by the President of France of the new Ecole Supérieure d'Electricité towards the end of the year. The Société Francaise was formed in 1884 and shortly afterwards started in Paris an Ecole d'Applications d'Electricité, through which, up to the end of 1913, no fewer than 4,000 students passed. The old premises even then had become too small and plans had been prepared for a new building. Owing to the war the scheme had to be temporarily abandoned; on the termination of hostilities an appeal was made to all the principal electrical firms in France to subscribe to a fund for the construction of an Ecole Supérieure d'Electricité worthy of the French industry. An excellent response was made to the appeal, a sum of no less than £57,220 being subscribed. The State made a grant of four million francs (£32,260), the Paris municipality one of £15,725, and the Department of the Seine £5,240, while the Société Francaise des Electriciens contributed about £850, bringing up the fund to approximately £111,295. A suitable site was chosen in the Avenue Pierre Larousse at Malakoff, a suburb of Paris, and a group of large modern buildings specially designed for theoretical and practical training in electrical work has been erected. The school, which continues under the direction of Prof. Paul Janes, covers an area of about 53,820 square feet and comprises lecture rooms, ordinary and research laboratories, electrical machine room, machine-tool shop, precision instrument testing room, &c. In addition to subscribing generously to the fund, many of the French electrical engineering concerns have also donated plant to the School, while others have supplied equipment practically at cost price. The building also now forms the headquarters for the Société Francaise des Electriciens and its library, and so forms an establishment where the veterans and rising generation of the French electrical industry may meet on common ground.

S.S. "Viceroy of India."

The first large passenger steamer to be fitted with high-pressure steam and turbo-electric propulsion was launched on September 15th from the yard of Messrs. A. Stephen & Sons, Ltd., Glasgow. The new 19,000-ton vessel, *Viceroy of India*, is intended for the service of the P. & O. Co., and she will rank as one of the most notable vessels built on the Clyde this year. She will be propelled at a speed of 19 knots by twin electric motors of 18,000 h.p. supplied from turbo-alternators taking high-pressure steam from water-tube boilers burning oil fuel. She is lighted and electrically heated by Diesel-electric generators. The turbo-alternators will each develop 9,000 kW at 2,700 r.p.m., the turbines being of the Curtis horizontal type, each having a Weir regenerative underslung condenser. The alternators are air-cooled, the air being forced in a closed circuit through the stator and rotor and thence through a cooler situated immediately below the alternator frame. The main propelling motors are of the synchronous three-phase type, and coupled directly to the propeller shafts at the aft end of the engine room. The motors develop 17,000 s.h.p. at 109 r.p.m. They are also air-cooled. Reversal of the propellers is obtained by changing the electrical connections by means of contactors, which are interlocked so that the operator can only close them in the correct sequence. This will allow the turbines to run continuously in one direction when manœuvring, and the total turbine capacity will be available for steaming astern. It is expected that when the vessel is steaming full-speed ahead it will be possible to reverse the propellers and turn in the astern direction in



18,000-h.p. Twin Propelling Motors of S.S. "Viceroy of India."

30 seconds from the order to reverse. The whole of the main propelling machinery, including both turbo-alternators and motors, has been manufactured by the British Thomson-Houston Co., Ltd. Steam is supplied at 350 lb. per sq. in. and 700 deg. F. by six Yarrow boilers, situated in two separate stokeholds. In addition to the Yarrow boilers there are also two cylindrical boilers in the forward stokehold for supplying steam in port. Two electric elevators run from the top through the passenger quarters. The general lines of the vessel are the result of many model experiments made in the National Experimental Tank at Teddington under the personal supervision of Viscount Inchcape, chief of the owners' company. The accompanying illustration shows the twin propelling motors on test in the B.T.-H. works.

Women's Engineering Society (Inc.).

The sixth annual Conference of Women Engineers is to open at Bristol University to-day. The presidential address will be given by Mrs. L. A. Willson, M.B.E., who is a director of Messrs. Smith, Barker & Willson, lathe makers, Halifax.

Lectures to Nurses.

A course of lectures dealing with electrical matters has been arranged for the Longsight Detachment of the British Red Cross Society by the Manchester and District Electric Circle. The first of them was given on September 11th by Mr. C. H. Rayner, who dealt in a very entertaining manner with the "Development of Electricity Supply." By means of extremely interesting lantern slides Mr. Rayner indicated very clearly the manner in which electricity is produced and the very many uses to which it may be put. Ensuing lectures will cover electrical refrigeration, invalid cooking by electricity, X-rays, electric light in the home, and wiring installations.

Fatalities.

An inquest was held at Shiremoor, Northumberland, on Thursday last upon the body of Matthew John Robson, a pan shifter, who was killed while at work in the Maud coal mine, Backworth, on September 3rd. It appears that deceased and another man were pushing a conveyor pan over a cable and that the pan cut into the sheath and made contact with the live conductors. Mr. J. A. B. Horsley, H.M. Electrical Inspector of Mines, suggested, as a means of preventing similar accidents in future, that no coal cutting or other operation requiring electric power should be carried on while conveyor pans were being moved across the cable. The jury returned a verdict of "Accidental death by electrocution."

While repairing a lift at Birmingham on September 18th, William Kite, aged 75, was klled by electric shock.

Appointments Vacant.

Shift engineers and fitter turbine drivers for the Scarborough Corporation Electricity Department. Plumber-jointer for the Ashford Urban District Council electricity works. Electrical engineer (£600) for the Nigerian Government Public Works Department. Retired officer with mechanical and electrical experience (£292) for the clerical staff of the War Office. Charge engineer (£362) for the Walthamstow U.D.C. Electricity Department. Meter fixer and reader for the Hornsey Borough Council Electricity Department. Meter tester and reader for the Electricity Distribution of North Wales and District, Ltd. (See our advertisement pages to-day.)

London and Home Counties Electricity District.

The Minister of Labour has given notice that as soon as may be after September 29th he will designate to the London and Home Counties Joint Electricity Authority, in accordance with Section 2 (10) of Part I of the First Annex to the Schedule to the London and Home Counties Electricity District Order, 1925, the employés' organisations having members in the employment of authorised undertakers in the district, in order that the organisations so designated may choose two representatives of persons employed in connection with the supply of electricity in the district to be members of the Joint Authority. Any employés' organisation which is desirous of being considered by the Minister for designation should make application in writing to the Minister not later than September 29th, 1928, on the form provided for the purpose, of which copies may be obtained from the Secretary, Ministry of Labour, Montagu House, Whitehall, London, S.W.1.

Electrical Engineers and Machine-Tool Design.

Speaking at a meeting of the Institution of Production Engineers at Olympia on Friday last, Sir Herbert Austin referred to the electrical driving of machine tools, and the tendency to design the machine tool with the electric drive as an integral portion of it. At the Leipzig Fair, he said, it was noticeable how the German machine-tool manufacturers were endeavouring to incorporate in their designs the driving motor and not to place it on a bit of a bracket attached to the machine, and he expressed the view that in a few years' time the electric drive, as a portion of the machine tool itself, would be universal.

Mr. A. Hutchinson (past president of the Institution) remarked that the individual drive of the machine tool electrically was wrapped up as much with the work of the electrical engineer as with the work of the mechanical engineer. If the machine-tool maker was to have a fair chance, the electrical engineer would have to co-operate. Electrical engineers could not expect to be able to go on making a standard type of motor to stand on four feet to be put anywhere, and then expect the machine-tool maker to bear the brunt of designing a machine tool to suit. The electrical engineers would have to come into line.

Sir Alfred Herbert (president) said that all who had been to Leipzig must have been impressed by the general adoption by German engineers of the flange type of motor built into the machine. He believed conditions with regard to electricity in Germany were very different from what they were in this country, and if we were to adopt the flange type of motor for machine tools—which was a most attractive thing—it could only be done to the full extent when there were uniform conditions as regarded electricity supply. The manufacturers of the motors, also, must get together and produce standard motors. One of the difficulties was that a good many orders for machine tools were to specifications prepared by consulting engineers. One consulting engineer would say, for example, that the motors must be made by Bill Sykes & Co., and that the power must be transmitted by Tom Jones's noiseless chain; the next consulting engineer would specify that his machines must be driven by motors built by Harry Robinson, and that the power must be transmitted by Mr. Richardson's patent laminated belt, whilst somebody else would want direct-geared motors and somebody else a raw-hide belt. The result was that the motors had to be put as Sir Alfred Austin had said, on a bit of a bracket, and the tool maker was usually very thankful when he found the bit of a bracket was large enough to carry the motor that was specified. Another difficulty arose when supplying machine tools to electrical plant manufacturing firms, which naturally would not have somebody else's motors on their machine tools; they wanted their own, so that if a manufacturer had standardised on some other make of electric motors he had to rip them out and put in those of the particular make. Clearly there was need for a great deal of standardisation in this matter. At the same time, it must not be assumed that the individual drive by electric motor would entirely supersede other forms of driving. For instance, where a number of small machines had to be driven, it would often be found more convenient to use a countershaft and one motor to drive all the machines.

Educational.

Northampton Polytechnic Institute.—The 1928-29 session commences on September 24th; enrolment of students for the evening class during the previous week. Courses of instruction in Fuel Technology are provided. Full particulars with syllaubuses may be obtained on application to the Institute. (See our advertisement pages to-day.)

The "Clerkenwell" Junior Technical Evening Institute.—The Institute opened on September 17th, and will meet on week-day evenings, except Saturdays, from 7 to 9 p.m.

University of London; University College, Faculty of Engineering.—The 1928-1929 session commences on October 1st.

Association of "Old Cromptonians."

In view of the recent dinner given by the directors of Messrs. Crompton-Parkinson, Ltd., to Colonel Crompton, to commemorate the jubilee of the foundation of the business—at which dinner a large number of "Old Cromptonians" were present—the committee has decided to postpone the annual dinner of the Association until the autumn. The date of the event will be announced later. The August, 1928, publication of the Association is now available.

The Batti-Wallahs' Society.

Under the rules of this Society all members are subject to re-election annually by the Committee—which must be unanimous. The scrutiny of the membership and re-election took place last week, when the Committee also confirmed the election of the following new members: Messrs. S. T. Allen, M.I.E.E., A. N. East, M.I.E.E., and A. J. Hedgcock, M.I.E.E.

Fuel Conference.

The official programme of the Fuel Conference of the World Power Conference, which is to be held at the Imperial Institute, South Kensington, S.W., from September 24th to October 6th, was issued this week. Owing to the unexpected absence abroad of Lord Melchett, the Marquess of Reading will preside at the official opening of the Conference in the Great Hall of the Institute at 3.0 p.m. on Monday, September 24th. The Rt. Hon. Sir Robert Horne will deliver the opening address. The Conference proper will commence on the second day and will continue till October 5th. Some 22 subjects are down for discussion, involving about 150 papers. Of course, most of the subjects have a bearing on the electrical industry, but some of those more directly concerned are: "Utilisation of Fuels for Steam Generation and the Production of Electricity"; "Utilisation of Fuels, including Electricity, for Industrial Furnace Work"; "Utilisation of Fuels, including Electricity, for Domestic Purposes"; "Pulverised Fuel"; and "Transmission of Power." On behalf of the Government there will be a reception by the Rt. Hon. Sir Philip Cunliffe-Lister, K.B.E., at Lancaster House, on the evening of September 25th. A number of visits are included in the programme. These include: The Port of London, September 27th; the County of London Electric Supply Co., Ltd. (Barking power station), and the Gas, Light & Coke Co. (Fulham Works), October 2nd; Fuel Research Station, East Greenwich, National Physical Laboratory, Teddington, and the Anglo-Persian Oil Co.'s laboratories at Sunbury-on-Thames, October 4th. Other social events will include an official banquet at the Connaught Rooms, W.C.2, on the opening day.

Institution Notes.

Institution of Electrical Engineers.

INFORMAL MEETINGS.—The following is the programme of discussions at informal meetings during the new Session :—

October 29th.—"Our Profession from a Manufacturer's Point of View." (Opened by the President, Lt.-Col. K. Edgcumbe, T.D., R.E.T. (ret.).)

November 12th.—"Engineering Requirements of a Modern Office Building." (Opened by Mr. J. Coxon.)

November 26th.—"Picture Telegraphy." (Opened by Mr. E. S. Ritter.)

December 10th.—"Power Factor Tariffs and Methods of Metering." (Opened by Mr. E. W. Dorey.)

January 14th, 1929.—"Electric Trolley Omnibuses." (Opened by Major A. Jenkin.)

January 28th.—"Mains Testing." (Opened by Mr. F. C. Raphael.)

February 4th.—"Earthing and the Safety of the Public." (Opened by Mr. W. R. Rawlings.)

February 18th.—"Modern High Power Rectifiers—Their Development and Use." (Opened by Mr. R. L. Morrison.)

Institute of Fuel.

Owing to the steady growth of the Institute of Fuel, the Council has taken more commodious premises at 53, Victoria Street, Westminster (same address and telephone number). The new offices will include, in addition to a general office and library, a reception and reading room available for the use of members during office hours, and the Council invites fuel technologists who are visiting London during the Fuel Conference to make use of the premises of the Institute; a stenographer and typist will be at their service for urgent correspondence.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

On September 14th members of the staff of the Hull Corporation Electricity Department met to make a presentation to Major HERBERT BELL, the engineer and manager, who takes up his position at Glasgow in October. The gathering, which was held at the Goodfellowship Inn, was a large one, and was presided over by Councillor Hubert Johnson, the deputy-chairman of the Electricity Committee; he was supported by Mr. C. I. Shuttleworth, deputy electrical engineer, Mr. John Work, and Mr. D. M. Buist, formerly personal technical assistant to Major Bell. The chairman referred to Major Bell's 32 years' association with the undertaking, during 25 of which he was its engineer and manager, to his absence with the Forces in Mesopotamia, and the restoration of the prosperity of the undertaking after his return. Mr. Shuttleworth made the presentation, which took the form of a silver tray; to the Major's daughter he presented a coiffure box. In responding the guest said that he was sorry to leave Hull but "you could not always stop in the same place—you must keep moving on."

Mr. F. G. LAMB, of the Wolverhampton Corporation Electricity Department showrooms, has been appointed junior consumers' engineer in the Plymouth Corporation Electricity Department.

The Tramways and Light Railways Association *Journal* mentions that Mr. W. T. HARROP, who recently retired from the position of claims superintendent of the Bolton Corporation Tramways after 25 years' service, is entering the ministry.

Mr. J. G. PEARCE, M.Sc., M.I.E.E., director of the British Cast Iron Research Association, received on September 4th from the Lord Provost of Glasgow, Sir David Mason, the award of 100 guineas for proposals relating to "Goodwill in Industry." The ceremony took place in the City Chambers, Glasgow, before a representative gathering of Clyde industrialists. Mr. J. M. Miller, vice-president, and Mr. J. Vance, past president, and chairman of the Goodwill Committee of the Glasgow and West of Scotland Association of Foremen Engineers and Draughtsmen, briefly outlined the history of the scheme, and indicated that the Goodwill Committee was now engaged in the remaining stage of collating the information for issue in published form.

Mr. H. E. METCALF has resigned his position with Messrs. Babcock & Wilcox, Ltd., with whom he has held important managerial appointments for 32 years, and has accepted the post of general manager of Ruths Steam Storage Co. A dinner was recently given to mark the occasion, Mr. F. E. Powell presiding. Those present included Professor A. G. Christie, of Johns Hopkins University, Baltimore, and Prof. Angus, of Toronto. Prof. Christie has just completed a stay in England, where he has been making a study of the place of the steam accumulator in electric power plant.

The Perth Town Council has appointed Mr. W. J. H. PENMAN, Edinburgh, manager of the Corporation tramway department. He was formerly assistant traffic superintendent with the Edinburgh Corporation Tramways.

Mr. T. B. GOODYER, O.B.E., A.I.E.E., M.Inst.T., who is retiring from the managership of the Croydon Corporation tramways at the end of this month, was, at the annual conference of the Municipal Tramways and Transport Association, held in Manchester on Wednesday last, unanimously elected an honorary member of the Association in recognition of his distinguished services to the tramway industry. Mr. Goodyer was president of the Association in 1918-19.

Lieut.-Col. J. T. C. MOORE-BRABAZON, M.P., is to be president of the Junior Institution of Engineers in succession to Sir Murdoch MacDonald, M.P.

Mr. J. R. Godderidge has recently resigned his position with the Hastings and District Tramways Co., with which he has been for the last ten years, and has taken up the appointment of assistant sales representative, with Messrs. W. T. Glover and Co., Ltd., of Trafford Park, at their Birmingham office.

Mr. R. H. SIMPSON, of the Traction Department of the British Thomson-Houston Co., Ltd., who recently underwent a serious operation in a Birmingham nursing home, is making good progress towards recovery and hopes to resume his duties at an early date.

Mr. H. FOSTER SMITH, M.C., A.M.I.E.E., has been appointed general manager of the Pará Electric Railways and Lighting Co., Ltd., Pará, Brazil. Mr. Foster Smith was a pupil of Messrs. Belliss & Morcom, and held their scholarship at Birmingham University. During the war he served with the Royal Engineers, and has been connected with his present company as an engineer since his demobilisation in March, 1919.

Councillor W. H. GILES, who has accepted the mayoralty of Burton-on-Trent, is chairman of the borough electricity committee, and is a Corporation representative on the East Midlands Electricity Advisory Board.

On the occasion of his marriage at Paulearspury, Northants., Mr. T. HEWITT PAYNE has been presented with a cheque by the technical and sales staffs of Crompton-Parkinson, Ltd., Chelmsford.

The Bury St. Edmunds Town Council has granted a bonus of £25 to, and increased the salary of, Mr. W. C. COOPER for services rendered as acting chief engineer at the electricity works during the illness of the late Mr. Day.

Mr. J. SCOTT, M.I.E.E., has accepted an invitation to become mayor of Bootle. He has been a member of the Bootle Town Council for 12 years, and is the Bootle representative on the Liverpool Tramways and Electric Power and Lighting Committee. He is also a member of the Council of the Incorporated Municipal Electrical Association.

The marriage took place last week at Festiniog of Mr. ALAN GREENWAY, electrical engineer, Chester, and Miss R. O. DAVIS, of Festiniog. The presents included a clock from the staff of Brookhirst Switchgear, Ltd.

The marriage took place recently of Mr. TERENCE C. MACNAMARA, youngest son of the Right Hon. T. J. Macnamara, LL.D., and Miss KATHLEEN JONES. The bride had for some years been with the British Thomson-Houston Co., Ltd., Rugby, and the bridegroom is a member of the experimental staff of the British Broadcasting Corporation.

The Guildford Town Council has appointed Mr. E. J. W. BROWN, who has for some years been with Messrs. Bruce Peebles & Co., Ltd., as deputy borough electrical engineer.

Mr. R. A. ETHERINGTON recently managing director of Walker Bros., Ltd., Guildford, is resigning his active position in order to accept an appointment as sales manager to the Trelleborge Ebonite Works, Ltd., of Union Place, London, W.1.

Mr. EDWARD J. VERRIER, of Rugby, late of Persia, has been appointed as superintendent of steam plants in Mexico City for the Mexican Light & Power Co. His address is 125, Calle Colima, Mexico City, Mexico.

Wills.—Mr. A A. PEECH, a director of Steel, Peech and Tozer, left £70,307 gross, and £50,783 net personalty.

Mr. G. A. ANDERSON, formerly chief engineer to the Indian Public Works Department, left £16,167 gross, and £15,764 net personalty.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companie Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Wireless Pictures (1928), Ltd.—Registered as a public company on September 14th. Nominal capital, £425,000 in 4s. shares. Objects:—To acquire (1) the trade mark No. 456,529 "Izon," (2) the benefits of an application numbered 493,129 for the registration of the word "Fultograph" as a trade mark, and (3) the undertaking of Wireless Pictures, Ltd.; to adopt agreements (*a*) with O. Fulton, (*b*) between C. H. Watson, F. W. W. Baker, and G. Pearce of the first part, T. Thorne-Baker of the second part, and C. H. Watson and F. W. W. Baker of the third part; (*c*) with A. E. Conrady and F. W. W. Baker; (*d*) between A. E. Conrady and F. W. W. Baker, and C. H. Watson, F. W. W. Baker, and G. Pearce; (*e*) between F. W. W. Baker, C. H. Watson, and G. Pearce of the one part and C. E. Green of the other part; (*f*) with W. Watson & Sons, Ltd.; (*g*) with G. E. Binsted; (*h*) with Wireless Pictures, Ltd.; and (*i*) with Beaconsfield Trust, Ltd.; to carry on by means of wireless, wireless broadcasting, telephone or telegraph lines or by any other means the business of transmission and the reception of pictures, &c. The minimum cash subscription is 7 shares. The directors are:—Capt. the Hon. F. E. Guest, M.P., 7, Aldford Street, Park Lane, W.; Sir Charles Bright, Little Brewers, Hatfield Heath, Bishop's Stortford; Sir Nicholas Grattan Doyle, M.P., Little Heath Lodge, Potter's Bar (director of Swears & Wells (1926), Ltd.); Lt.-Col. A. F. H. S. Simpson, 3, Eaton Gate, S.W.1 (managing director of Oliver Typewriter Manufacturing Co., Ltd.); Sir Charles C. Sanderson, 65, Gordon Road, Ealing, W.5 (chairman of British Neopost, Ltd.); W. H. Lynas, 61, Frognal, Hampstead, N.W.3, radio manufacturer. Qualification, £100. Remuneration, £350 each per annum (chairman £450). The directors shall not, without the sanction of a general meeting, borrow any sum which will make the amount borrowed and then outstanding exceed twice the nominal amount of the capital. Secretary: J. S. Bird. Registered office: 11, Bishopsgate, E.C.3.

Hygienic and General Sales Co., Ltd.—Private company. Registered September 8th. Capital, £3,000 in £1 shares. Objects: To adopt an agreement with G. Jones and P. G. Jackson and to carry on the business of mechanical, electrical, and general engineers and manufacturers, manufacturers of and dealers in all kinds of cleaning machines, sweepers, refrigerators, irons, fans, stoves, lamps, &c. The permanent directors are: G. Jones, "Kildare," Cobham Road, Westcliff-on-Sea; P. G. Jackson, 19, Bellingham Road, Catford, S.E.6. Registered office: 37-8, Strand, W.C.

Austinlite, Ltd.—Private company. Registered September 8th. Capital, £6,000 in £1 shares. Objects: To acquire the business of electrical engineers as carried on at Banbury until recently by the Austin Lighting Co., Ltd., and since March 10th, 1928, carried on by the Clarkson Thimble Tube Boiler Co., Ltd. The directors are: H. F. Marriott (chairman), Heids, Morland Close, N.W.11; H. J. Fountain, address not stated; H. J. S. Stobart, Church House, Belbroughton, near Stourbridge; J. R. Wharton, address not stated. Registered office: 1, Broad Street Place, E.C.2.

Mercurial Cut-Outs, Ltd.—Private company. Registered September 8th. Capital, £100,000 in £1 shares. Objects: To acquire interests in any invention relating to electrical apparatus, and to carry on business as mechanical and electrical engineers in all branches. The first directors are: B. Bell, Hotel Russell, W.C.1, engineer; G. E. Perkins, 44, Cheniston Gardens, Kensington, W.8, engineer (director Franco-British Oil Trust, Ltd.); V. Hartshorn, P.C., M.P., Hill Crest, Maesteg; C. J. Woore, Atherstone, Bazile Road, Grange Park, N.21, East Indian merchant (permanent chairman); M. W. Beasley, 21, Crescent Road, Alexandra Park, N.22, company secretary. Secretary: M. W. Beasley. Registered office: 126, Bishopsgate, E.C.2.

Healey Mouldings, Ltd.—Private company. Registered September 10th. Capital, £5,000 in £1 shares. Objects: To adopt an agreement with T. G. P. Healey, and to carry on the business of manufacturers of any article made from moulding powders of any description, celluloid, casein, and plastic substances, wood, metal, leather, paper, rubber, ebonite, pulp or other material, manufacturers of fancy goods and novelties, electrical or other instruments, wireless parts and motor trade accessories. The directors are: A. L. Leigh, Herns Nest, Bewdley, Worcs.; T. G. P. Healey, 239 and 241, Great King Street, Birmingham (managing director); G. Elvins, Luttrell House, Four Oaks, Warwickshire. Secretary: P. H. Stone. Registered office: 47, Temple Row, Birmingham.

Percy Healey, Ltd.—Private company. Registered September 10th. Capital, £2,000 in 800 ordinary and 1,200 5 per cent. cumulative preference shares of £1 each. Objects: To acquire the business of a manufacturing jeweller, electrician, and manufacturer, importer and general dealer in all kinds of electrical appliances and equipment and woodworking, and all types of articles in "Bakelite" and the like carried on by P. Healey, at 241, Great King Street, Birmingham, as "Percy Healey." The directors are: P. Healey (permanent managing director), Park Lane, Bewdley, Worcs.; Miss B. A. Harman, Park Lane, Bewdley, Worcs. Secretary: Miss B. A. Harman. Registered office: 241, Great King Street, Birmingham.

C. N. Vernon & Co., Ltd.—Private company. Registered September 13th. Capital, £1,000 in £1 shares. Objects: To acquire the business of wireless engineers and contractors, &c., heretofore carried on by C. N. Vernon and J. W. Vernon as "C. N. Vernon & Co." at 11, Halliwell Street, Manchester. The directors are:—C. N. Vernon, 222, Bury New Road, Whitefield, near Manchester; J. W. Vernon, "Bonanova," Whitefield, near Manchester.

Judd Accumulator and Equipment Co., Ltd.—Private company. Registered September 13th. Capital, £4,000 in 3,900 10 per cent. preference shares of £1 each and 2,000 ordinary shares of 1s. each. Objects: To acquire from G. Judd the benefit of certain existing inventions relating to electric storage batteries or accumulators and patents numbered 251,487, 251,488 and 251,489, and to carry on the business of electrical dealers and engineers carried on by him at Raymouth Road, Bermondsey. The first directors are:—G. P. Chamberlain, 14, Montague Avenue, Brockley, S.E.; R. H. Rockliff, 32, Jenner House, Hunter Street, W.C.; W. J. Willis, 26, Sheringham Road, Anerley, S.E.; G. Judd, Raymouth Road, Bermondsey. Secretary: Miss P. Tuckfield, Sun Garth, Chessington Road, West Ewell.

Edison Bell (International), Ltd.—Public company. Registered as a public company September 13th. Nominal capital: £300,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in phonographs, gramophones, records and machines, telephones, wireless apparatus and accessories, animated photographic instruments and apparatus, &c., and to adopt an agreement with Edison Bell, Ltd. The directors are:—R. Hawkes, 83, Piccadilly, W. (director of Hawkes & Son (London), Ltd.); H. Hesford, 10, Langdale Road, Hove, T. Hough, 174, Barry Road, East Dulwich, S.E., and W. F. Robbins, "Lyndhurst," Pembroke Avenue, Margate (directors of Edison Bell, Ltd.); and A. B. Goodman, 208, Lauderdale Mansions, W.9 (director of Edison Bell (Penkala), D.D.). Secretary: C. E. Fletcher. Registered office: Edison Bell Works, 62, Glengall Road, Peckham, S.E.15.

Official Returns of Electrical Companies.

J. L. Maughan & Co., Ltd.—Mortgage dated August 18th, 1928, to secure £49 4s. charged on 29, Carliol Street, and 13, Erick Street, Newcastle-upon-Tyne. Holder: S. Phillips, 86, Pilgrim Street, Newcastle-upon-Tyne.

Octron, Ltd. (formerly H-S Electric, Ltd.).—Particulars filed of £2,500 debentures authorised July 30th, 1928, charged on the company's undertaking and assets, including uncalled capital, the whole amount being now issued. Satisfaction in full on August 13th, 1928, of debenture dated November 25th, 1927, securing £3,000.

Llanrwst Electricity Supply Co., Ltd.—H. S. Baker, 4, Broad Street Place, E.C., was appointed by Order of Court dated July 16th and sealed August 10th, 1928, receiver of the undertaking of the company and the net earnings of the statutory undertakings of which the company are the undertakers under the Llanrwst Electricity Lighting Order, 1920, and the Trefriw Electric Lighting Order, 1902, in substitution for the late W. J. Parry.

Prothero Steel Tube Co., Ltd.—Satisfaction in full on July 2nd, 1928, of first mortgage debenture dated September 24th, 1926, securing £20,000.

Stella Lamp Co., Ltd.—Satisfaction to the extent of £5,000 on April 2nd, 1928, of debentures dated June 7th, 1922, securing £23,500. (Notice filed September 7th, 1928.)

C. F. Elwell, Ltd.—A. White, of 34, Norfolk Street, W.C.2, ceased to act as receiver or manager on July 31st, 1928.

Electric Art Shades (1928), Ltd.—Debenture dated August 22nd, 1928, to secure £250, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: H. A. Chard, Kelvedon, Essex.

Wireless Engineering Co. (Scunthorpe), Ltd.—Debenture dated September 3rd, 1928, to secure £200, charged on the company's assets, including uncalled capital. Holder: Mrs. M. Bone, "Jordans," 75, Brumby Wood Lane, Scunthorpe, Lincs.

Radio Service (London), Ltd.—Part satisfaction to the extent of £125 on August 15th, 1928, of debenture dated July 25th, 1927, securing £2,750.

Climax Vacuum Cleaner Co., Ltd.—H. L. Williams, of 147, Cannon Street, E.C.4, ceased to act as receiver or manager on September 5th, 1928.

City Notes.

New Issues.

Wireless Pictures (1928), *Ltd.*—Particulars of this company's constitution and objects appear in the "New Companies" section of this issue. On Monday last the company published a prospectus offering for subscription 775,000 ordinary shares of 4s. each at par. In this it was stated that 400,000 shares would be allotted to the vendors in part satisfaction of the purchase consideration, plus £45,000 in cash. It is estimated that £80,000 of the proceeds of the issue will be available for working capital and general purposes. The "Fultograph" apparatus will be sold to the public, and licences for the use of the system will be granted to newspapers and news agencies. The company intends to manufacture the apparatus in this country, and hopes to have it available during the forthcoming wireless season. The B.B.C. has arranged to commence in October an experimental transmission of photographs, &c., by means of the "Fultograph" system. It is stated that recently pictures have been transmitted successfully from Vienna to London, a distance of about 850 miles. The list was closed on the day of issue, but country applications received on Tuesday morning were to be considered.

Edison Bell (International), Ltd.—The formation of this company is also recorded in our "New Companies" section to-day. On Tuesday this week the company made an issue of 225,000 shares of £1 each at par. The balance of the shares (75,000) are reserved for future issue, subject to an option on 25,000 given to Messrs. Myers & Co., the underwriters of the issue. The company is to undertake electrical gramophone recording and the sale of the products of Edison Bell, Ltd. It is estimated that a sum of £115,000 will be available for working capital from the proceeds of the issue.

Power Corporation of Canada.

The report for the year ended June 30th last shows that the gross earnings increased from $796,635 to $2,128,641, and the net earnings from $709,464 to $1,802,557. The investments in affiliated and other companies rose from $10,509,434 to $24,398,763; during the year a substantial interest was acquired in the British Columbia Power Corporation. The common stock of the company has risen from $1,875,000 to $3,495,500, and the non-cumulative preferred stock from $2,500,000 to $5,000,000.

Altrincham Electric Supply, Ltd.

The profit for the year ended December 31st, 1927, was £25,209; a balance of £1,758 brought forward is added, making £26,967. After deducting directors' fees, preference dividends and interim ordinary and deferred dividends, the directors recommend final dividends on the ordinary shares (£1,000) and the deferred shares (£1,000), leaving £1,759 to be carried forward.

Eastern Extension, Australasia and China Telegraph Co., Ltd.

The directors have declared an interim dividend for the three months ended June 30th, 1928, of 5s. per share, free of tax.

Eastern Telegraph Co., Ltd.

The directors announce the payment of a dividend of 2½ per cent. on the ordinary stock, free of tax, for the quarter ended June 30th.

Stock Exchange Notices.

Application has been made to the Committee to allow the following to be officially quoted:—

County of London Electric Supply.—96,517 six per cent. cumulative preference shares of £1 each, fully paid, Nos. 4,725,001 to 4,821,517.

Dealings in the following have been specially allowed by the Committee under Rule 159:—

County of London Electric Supply.—96,517 6 per cent. cumulative preference shares of £1 each, fully paid, Nos. 4,725,001 to 4,821,517.

Underground Electric Railways.—47,282 ordinary shares of £1 each, fully paid, Nos. 5,624,096 to 5,671,377.

German Companies.

The *Rheydt Cable Works* is paying a dividend of 12 per cent. for 1927-28 on share capital of 7,560,000 marks, as for 1926-27.

The *Electricity Company* (*late W. Lahmeyer*), Frankfort-on-Main, reports net profits, including the balance forward, amounting to 2,032,000 marks for the year ended June 30th last, as compared with 2,011,000 marks in the previous year. It is proposed to maintain the dividend at 10 per cent.

Direct Spanish Telegraph Co., Ltd.

An interim dividend of 4 per cent., free of tax, has been declared on the ordinary shares, as in 1927.

Automatic Telephone Manufacturing Co., Ltd.

An interim dividend of 9d. per share has been declared on the ordinary shares, as last year.

International Automatic Telephone Co., Ltd.

The interim dividend on the ordinary shares is again 3¾ per cent.

Ward & Goldstone, Ltd.

The directors have declared a dividend on the ordinary shares of 4 per cent., as compared with 7 per cent. last year.

Associated Fire Alarms, Ltd.

The directors recommend a dividend of 8 per cent. (against 6 per cent.) on the ordinary shares for the past year.

Cammell, Laird & Co., Ltd.

The directors announce that no interim dividends are to be paid on the cumulative preference and ordinary shares.

British Insulated Cables, Ltd.

The ordinary shareholders are again to receive an interim dividend of 5 per cent.

Midland Electric Corporation for Power Distribution, Ltd.

The interim dividend on the ordinary shares is 6d. per share, as compared with 1s. last year.

Electric Supply Corporation, Ltd.

The ordinary shares are again to receive an interim dividend at the rate of 8 per cent. per annum.

Hendon Electric Supply Co., Ltd.

An interim dividend at the rate of 10 per cent. per annum has been declared on the ordinary shares, as in 1927.

Northern Mexico Power and Development Co.

A dividend of 1 per cent. has been declared on the common stock.

International Telephone and Telegraph Corporation.

On September 14th the directors declared the regular quarterly dividend of 1¾ per cent., payable October 15th, 1928.

Stocks and Shares.

MONDAY EVENING.

MATTERS of interest in the Stock Exchange have shifted more to the speculative departments during the past week than has been the case for some time. Investment is calling something of a halt, except in certain specialised sections, of which the insurance share market is one, and that for banking shares is another. The fever of speculation flames high in gramophone and record shares, an almost new market having been created in the Stock Exchange. It is beyond doubt that speculation is running wild over a good many of these newly-introduced shares in companies that have yet to make good. Meanwhile the established industrials have reached a position at which the prices of their shares offer, in a good many cases, little more yield than can be obtained from investment in first-rate securities. How this applies to the electricity group can be verified by reference to our table on the following page. A good many of the London electricity supply shares are now quoted ex the interim dividends, and the deductions render the shares a little more attractive than they were with the prices *cum* dividend. A few shares have come to market, apparently on behalf of people who had been intending to sell but wished to take their dividends first, and, therefore, deferred their selling until after the prices had gone ex. County of London ordinary shares are 40s. 6d. ex dividend, the deduction being regained. The same thing has happened in the cases of Chelseas and South Londons.

Clyde Valley's Rise.

The principal movement in this section is a rise of 2s. 6d., to £2 in Clyde Valley shares, which were urgently wanted by two of the northern exchanges. Scottish Power new shares are 6d. better on the week at 5s. 9d. premium. Yorkshire Electric ordinary put on 1s., strengthening to 37s. 6d. Newcastle-on-Tyne are quoted at 26s. 3d. middle, but could probably be bought at that price. A decline in Midland Electric Power shares took the price back to 2 1/16. The company has declared an interim dividend of 6d. per share, against 1s. this time last year, the capital having been doubled in the meantime.

Cable Stocks.

There is little of real interest to report this week in connection with cable stocks. The Eastern quartette is steady in price, but shows no resiliency, for although the quotations are maintained, the market has come to a "mark-time" position, in which quotations are left from day to day practically without movement. It may be that the swift jump in the price of Marconi shares will energise the cable stocks, but at present no such indication is manifest, and the market in them is quiet—almost stagnant. Some of the American stocks are easier, a fall of three points occurring in International Telephone and Telegraph capital stock, which lowered the quotation to 183. American Telephone & Telegraph is 2 down at 185, this being ex dividend. Anglo-Americans are very steady, and United River Plates remain at 9⅞. Anglo-Portuguese Telephones at 24s., Bogota Telephones at 32s. 6d., and Orientals at 55s., are very much the same as they were a week ago, nor is there any alteration to record in the prices of Automatic Telephones or Internationals, the latter being 41s. 6d., and the "B" deferred shares 39s. Telephone Manufacturing remain at 6s. 4½d. The International Automatic Telephone Company has declared an interim dividend of 9d. per share less tax, the same as a year ago.

Marconis.

Marconis are a very lively market, gaining renewed strength after every slight reaction that occurs. The price has gone up to 71s. 3d., and, according to people who should know what is happening, the support comes from New York. Talk has been current for some time past of a gigantic radio combine. It is difficult to suppose that the control of the Marconi Company would be allowed to pass out of British hands, and this consideration must be present to anyone who has followed the trend of recent international schemes. However, the buying of Marconis is attributed to American sources, and it has certainly been very persistent. Marconi Marines are better at 52s. 6d. Canadians keep about 30s. 9d.

British Control.

Siemens have risen 1s. 3d. to 30s., on the issue of a disclaimer from the company in regard to reported relations between Siemens Brothers & Company, the British undertaking, and Siemens & Halske, of Berlin. The reports hinted at the possibility of there being insufficient safeguards to prevent control passing into foreign hands. Siemens Brothers and Company point out that the company's articles of association provide all the necessary safeguards against such a contingency.

Crompton Parkinson.

The first report and accounts (covering 15 months) have now been issued by Crompton Parkinson, Ltd., and the price of the preferred ordinary has hardened to 18s. The company is paying a dividend of 10s. per share on the deferred, which are privately held. For the 8 per cent. preference shares, £17,072 is required, and the new 6 per cent. preferred ordinary take £9,803 for their dividend, these being for 15 months and six months respectively. With £25,600 brought in, the company had a disposable balance of £96,400, so the dividends are well covered on the 15 months' figures up to June 30th last.

The Manufacturing Group.

British Insulated Cables shares are unchanged at 4 3/16, and so is the interim dividend of 5 per cent. A final of 10 per cent. made up the 1927 dividend to 15 per cent. The rise in British Aluminium has been checked; a decline of 9d., to 47s. 6d., followed upon the brisk rises of the past fortnight. Johnson & Phillips dropped back ½ to 37s. 6d. The iron and steel market has been showing strength, and one of the results is a rise of 2s. 6d., to 3½, in Babcock & Wilcox. The shares are regarded as being amongst the soundest in their particular class. Although they yield no more than 4½ per cent. tax-free, the prospect of a trade revival is deemed sufficient warranty to justify the shares being held on the hope of increased dividends. Vickers slipped back a few pence. Armstrongs are very neglected.

"Utilities."

Mexico Tramways shares regained 3 points with a spurt to 42: otherwise the Mexican utilities have not changed. Brazil Tractions dipped to 58 and rallied to 60¼. The "Loewenstein Shares," as they are still called, have gone ahead, Hydros to 37½ and International Holdings to 16⅛. Barcelona Tractions aroused a little interest. Canadian and American hydro-electrics are somewhat firmer. The British public's business in American industrial shares is showing weekly expansion. Manila Electric 1st mortgage bonds are 4 up, at 97½. On the other hand, Rio Tramways show a disposition to droop, the 50-year mortgage bonds being lower at 91.

Miscellaneous Items.

South Wales Power ordinary stock came on offer at 82, after being nearly 85. Bermuda Traction debenture seems to have taken up its stand at 4 discount. At present the scrip is £30 per cent. paid; the other £70 is due by instalments. The first interest is £1 8s. 5d. per cent. next January; the next, £2 17s. 4d. per cent. in July, 1929. Interest is paid out of capital during the construction of the line. The shares are quoted at 12s. 3d. Atlas Light & Power £1 ordinary can be bought at 19s. 9d., ex the October dividend, free of stamp and fee. For the last year, the dividend came to 5 per cent.

Share List of Electrical Companies.

	Nom.	Dividend. 1926.	1927.	Price Sept. 17, 1928.	Rise or fall.	Yield. p.c.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	£1	14†	15	3⅜	—	... ...
Brompton Ordinary	1	8⅝	8½	27/-xd	—	5 3 8
Charing Cross Ordinary	1	8½	8½	27/-	—	5 3 8
do. do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Chelsea	1	8⅝	8⅝	2xd	+3/32	5 1 10
City of London	1	10	10	33/3xd	—	4 4 4
do. do. 6% Pref.	1	6	6	23/-xd	—	5 4 4
Clyde Valley	1	8	8	37/6	+2/6	4 0 0
County of London	1	7½	7½	40/6xd	+6d.	3 14 3
do. do. 6% Pref.	1	6	6	23/6	—	5 2 2
Edmundsons' 7% Pref.	1	7	7	25/6	—	5 9 10
Elec. Supply Corporation	1	11	11	52/-xd	+1/16	4 4 9
Kensington Ordinary	1	8	8	36/6	—	5 5 8
Lancs. Light and Power	1	7½	7½	30/6	+6d.	5 0 0
London Electric	1	8½	8½	28/-	—6d.	4 18 3
Metropolitan	1	8	9	48/9	+6d.	3 13 9
do 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	6	6½	31/6	—	4 2 6
Mid. Elec. Power	1	—	15	41/8	—5/16	... ...
Newcastle-on-Tyne Ordinary	1	5	6	26/3	—	4 11 5
do. 7% Pref.	1	7	7	27/-	—	5 3 8
Notting Hill 6% Pref.	10	6	6	10⅝	—	5 11 7
North Met. Elec. 6% Pref.	1	6	6	23/-	—	5 4 4
St. James' and Pall Mall	5	8	8	27/6	—	5 1 10
Scottish Power	1	8	8	32/6	—	4 18 6
South London	1	8½	8½	27/-xd	+6d.	5 3 8
Urban Ordinary	1	7	7	35/-	—	... ...
Westminster Ordinary	1	8⅛	8⅛	27/-	—	5 3 8
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	24/-	—	6 5 0
Yorkshire Elec.	1	8	8	37/6	+1/-	4 5 4
HOME RAILS.						
Central London Ord. Assented	Stock	4	4	72xd	—	5 11 1
Metropolitan	,,	3	3	67½	—	4 9 0
do. District	,,	3½	4	79½	—	5 0 8
Underground Electric	£1	1½	5	27/6xd	—	3 12 9
do. do. Income	Bonds	6	6	130	—	4 12 4
TELEGRAPHS AND TELEPHONES.						
Anglo-Am. Tel. Pref.	Stock	6	6	104	+	5 15 5
do. Def.	,,	1½	1½	24	—	6 5 0
Automatic Telephone	1	10	10	43/9	—	4 9 0
Eastern Extension	10	10	10	24⅞	—⅛	*4 0 4
Eastern Tel. Ord.	Stock	10	10	247½	—	*4 0 10
Globe Tel. and T. Ord.	10	10	10	24⅜	+¼	*4 1 0
do. do. Pref.	10	6	6	11⅛	—	5 7 10
Great Northern Tel.	10	20	20	38½	—¼	5 4 0
Indo-European	25	10	10	40½	—	*5 7 6
Marconi	10/-	5	*10	3⅞	+⅛	... ...
Marconi-Marine	1	8½	12½	52/6	+1/6	4 15 3
Oriental Telephone Ord.	1	12	12	56/3	—	*4 5 3
United R. Plate Tel.	5	8	8	9⅞	—	*4 1 0
Western Telegraph	10	10	10	24⅛	—	4 0 4

*Interim.

HOME AND FOREIGN TRAMS, &c.						
Anglo-Arg. Trams First Pref.	£5	5½	5½	8⅜	—	7 11 9
do. do. 2nd. Pref.	5	6	6	8½	—	8 11 6
do. do. 5% Deb.	Stock	5	5	78½	—	6 7 5
British Electric Traction Def. Ord.	,,	—	—	520	—	... ...
do. do. Pref. Ord.	,,	8	7½	125	—	6 0 0
Brazil Traction	100	6	7	60½	+1	2 18 2
Brit. Colombia Elec. Rly. Pcc.	Stock	5	5	96½	—	5 3 9
London & Sub. Trac. 5% Pref.	1	Nil	Nil	10/6	—	... ...
London United Tram Deb.	Stock	4	4	60½	—	6 12 3
Mexico Trams, 5% Bonds	—	5	5	78	—	6 8 2
Mexican Light Common	100	Nil	Nil	84½	—	... ...
do. 7% Pref.	100	Nil	7	77½	—	9 0 8
do. 1st Bonds	—	5	5	79½	—	6 5 9
Yorkshire (West Riding)	1	Nil	Nil	5/-	—	... ...
MANUFACTURING COMPANIES.						
Babcock & Wilcox	1	13	15	70/-	+½	*4 5 9
British Aluminium Ord.	1	10	10	47/6	—9d.	*4 4 2
British Elec. Transformer Pref.	1	7	7	18/-	—	7 15 0
British Insulated Ord.	1	15	15	4⅛	—	3 11 9
Brush Ord.	1	10	10	27/6	—	7 5 6
Callenders	1	15	15	4⅛	—	3 14 0
do 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Parkinson Pref Ord.	1	—	6	18/-	+6d.	6 13 4
do. 8% Pref.	1	—	8	26/3	—	6 2 0
Edison-Swan	4/-	10	10	12/6	—	3 4 0
do. 5% Deb.	Stock	5	5	89½	+1½	5 11 9
Electric Construction	1	7½	7½	27/6	—	5 9 1
Enfield Cable Ord.	1	20	20	4⅜	—	4 11 6
English Electric	1	Nil	Nil	7/6	—	... ...
do. do. Pref	1	3	Nil	10/-	—	... ...
Gen. Elec. Pref.	1	6½	6½	24/6	—	5 6 1
do. Ord.	1	7½	10	41/-	—	4 17 7
Henley	1	25	25	5½	—	4 11 0
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	Nil	Nil	13/9	—	... ...
Johnson & Phillips	1	12½	10	1⅞	—½	5 6 8
Met.-Vickers Ord.	1	8	6	33/3	—	3 12 3
do. Pref.	2	8	8	2⅜	—	6 1 11
Siemens Ord.	1	7½	7½	1½	+1/16	5 0 0
Telegraph Construction	12	10	10	24⅛	—	*4 18 6

*Dividends paid free of Income Tax.

†4% of which was tax free.

Our Foreign Electrical Trade.

Electrical Exports and Imports during August, 1928.

THE most unsatisfactory fact which emerges from the Board of Trade figures of our electrical exports and imports during August is that the exports so far this year have been less than in the first eight months of 1927. The situation is accentuated by the large rise in imports which has taken place.

Some consolation may perhaps be derived from the fact that the August export total was greater than July's. This was due mainly to the large increase in the submarine cable item and smaller rises in the cases of "other" motors and generators, and batteries and accumulators. The increases were partly offset by smaller shipments of insulated wires and cables and of three or four other items. As compared with August, 1927, there was a fall of over £86,000, and there were some wide fluctuations among the constituent classes. There was a decrease of more than £100,000 in the telegraph and telephone class, chiefly on account of smaller exports of instruments and apparatus; also, the shipments of non-submarine cables were almost halved. On the contrary, the machinery section recorded a substantial rise—over £29,000—and the exports of unenumerated goods were well in excess of those of August, 1927. The result of the decrease in the August total as compared with the corresponding month of last year was a decline of £61,406 in the eight months' total.

As compared with July the imports showed a rise of £90,379. The increase was general, only three items showing small decreases. Unenumerated electrical goods and batteries and accumulators registered the greatest rises. The total was nearly £150,000 above that of August, 1927; in this comparison, also, there were only three falls. Electrical machinery and unenumerated goods were mainly responsible for the higher figure, while telegraph and telephone apparatus and insulated wires and cables made substantial contributions as well.

The only notable feature in the re-export section was the increase as compared with August, 1927; as will be seen, this was principally due to unenumerated goods and apparatus.

In the following table we show the distribution of our electrical machinery exports during August, the figures being compared with those for the corresponding month of last year :—

Destination.	Aug., 1927. £	Aug., 1928. £	Inc. or dec. £
European countries ...	88,446	95,833	+ 7,387
Japan	17,854	21,456	+ 3,602
South America	43,265	79,757	+36,492
South Africa	112,286	25,944	−86,342
British India	83,730	155,129	+71,399
Australia	91,146	84,370	− 6,776
New Zealand	52,056	20,902	−31,154
Canada	6,576	15,993	+ 9,417
Other countries	57,679	75,920	+18,241
Totals	£553,038	£575,304	+£22,266

From the above statistics it will be seen that the increase was due entirely to the greater shipments to non-Empire countries; the share of the parts of the Empire specified fell from £345,794 to £302,338.

Although the export figures would make it appear that the electrical manufacturing industry is declining, unless the fall is balanced by home orders, there is reason to believe that the year's total will not fall short of last year's. Many large and important contracts have been received from the Dominions and foreign sources this year, and some of these will probably have their effect upon the export figures during the later months of the year. We may mention as examples the order placed in connection with the Yallourn (Vic.) undertaking with the English Electric Co., Ltd.; the contract for electrical equipment for the Sydney (N.S.W.) Suburban Railways, given to the Metropolitan-Vickers Electrical Co., Ltd.; the hydro-electric plant being supplied to the Palestine Electric Corporation by the General Electric Co., Ltd.; the equipment for the Indian State Railways by the British Thomson-Houston Co., Ltd.; and the contracts placed with British companies in connection with the electrification of the Hungarian State Railways. These are only a few of the important orders which we have noted from time to time.

	Exports.			Imports.			Re-Exports.		
	Electrical exports for Aug., 1928.	Inc. or dec. as compared with July, 1928.	Inc. or dec. as compared with Aug., 1927.	Electrical imports for Aug., 1928.	Inc. or dec. as compared with July, 1928.	Inc. or dec. as compared with Aug., 1927.	Electrical re-exports for Aug., 1928.	Inc. or dec. as compared with July, 1928.	Inc. or dec. as compared with Aug., 1927.
Electrical goods and apparatus (unenumerated)	£215,871 −	£2,323 +	£44,786	£144,022 +	£35,576 +	£43,479	£9,310 +	£2,493 +	£5,096
Insulated wires and cables ...	197,151 −	36,897 −	35,127	73,427 +	2,625 +	19,885	709 +	13 +	187
Glow lamps	36,455 −	6,002 −	13,475	39,287 +	5,805 +	5,779	2 0 −	504 −	568
Arc lamps and parts ...	711 −	662 +	241	5,929 +	3,122 +	2,033	10 +	2 −	54
Batteries and accumulators ...	116,762 +	18,431 −	1,105	63,984 +	23,651 −	2,671	693 +	393 +	554
Meters and instruments ...	31,439 −	404 −	4,652	21,734 −	3,888 +	1,717	325 −	570 −	523
Carbons	450 +	183 +	316	6,219 −	886 −	2,016	68 −	18 +	26
Switchboards (not telegraph or telephone)	9,795 +	3,961 +	1,235	— −	3 −	—	—	—	—
Electrical Machinery—									
Electrical machinery (unenumerated)	326,082 +	5,547 +	14,789	159,346 +	9,095 +	63,934	8,062 −	3,265 −	30
Railway and tramway motors	23,515 −	1,978 +	947	—	—	—	—	—	—
Other motors and generators ..	225,677 +	25,118 +	7,030	—	—	—	—	—	—
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cable (not submarine)	50,910 −	7,930 −	49,436	6,709 +	4,721 −	5,080	— −	74 −	269
Submarine telegraph and telephone cable	39,415 +	31,204 +	4,146	—	—	—	—	—	—
Telegraph and telephone instruments and apparatus ...	162,136 −	2,829 −	55,227	55,327 +	10,511 +	22,708	3 513 +	979 +	1,230
Totals	£1,436,399 +	£25,419 −	£86,042	£575,981 +	£90,379 +	£149,738	£21,920 −	£557 +	£5,799
		Exports.			Imports.			Re-Exports.	
Increases or decreases for eight months of 1928		−£61,406			+£501,332			+£18,570	

The British Association—III.

The Glasgow Meeting.

AFTER the usual week end of visits and trips, the sectional meetings were resumed on September 10th. There was little of outstanding interest in Section G (Engineering) except the reference in a paper by Mr. A. E. L. Chorlton (Messrs. William Beardmore & Co.) to the use of a heavy-oil engine on a train being run experimentally by the L.M.S. Railway between Lytham and Blackpool, electrical means being adopted to transmit the power to the wheels. From the discussion, it would rather appear that Sir Henry Fowler, one of the chief mechanical engineers to the railway, is not much enamoured of electrical transmission on the score of alleged extra cost, although nothing very definite was said. The point is that this rather novel locomotive is easily meeting the old steam train schedule at a fuel cost of 3d. per mile, and is not only doing the work of three steam locos. but is saving £10 per week in wages. The driving equipment is at one end of the train and is electrically controlled from either end. For the moment, the railway company is not disposed to say much about the experiment which only started on July 25th, but the promise has been made that full details will be issued later when certain tests have been concluded.

There were several matters in Section A (Mathematical and Physical Sciences) to which reference may be made. In the first place, there was the presidential address by Prof. A. W. Porter, F.R.S., "The Volta Effect; Old and New Evidence," which was abstracted in our last issue. Following that was a paper by Mr. R. A. Watson-Watt on the present state of our knowledge of atmospherics, in which was reviewed the available evidence as to the origin and properties of naturally occurring electromagnetic waves of radio-telegraphic frequency.

The study of the heat vibrations of a crystal lattice by means of X-rays, and its bearing on the question of zero point energy, was discussed by Mr. R. W. James. From measurements of the intensity of reflection of X-rays from a crystal face at a series of angles, he said, it is possible, in some simple cases, to determine the average scattering power for X-rays of the atoms of which the crystal is composed, as a function of the angle of scattering, and hence to deduce the distribution of the electrons within the average atom. This distribution is affected by the heat vibrations of the crystal lattice, which must be taken into account in any comparison of the electron distribution, deduced in this way, with those given by different atomic models.

In a paper on "The Frequency Variations of the Triode Oscillator" Mr. David F. Martyn stated that previous theories of frequency variation are inadequate to account for the large variations which can be obtained. A theory based on the flow of grid current was outlined, and shown to be capable of explaining all the observed variations in detail. The conditions for the elimination of grid current were described, and it was shown that when no grid current flows the frequency of the oscillator can be kept constant to one part in 100,000 without special precautions, thus greatly increasing the value of the triode oscillator as a means of making physical measurements of high accuracy.

"Skill in Industry" formed the subject of a joint discussion between Sections F (Economic Science and Statistics) and J (Psychology) in which once again, as in many of the proceedings before the Psychological Section, the academic predominated. There was, however, some comment on the practical engineering side to which fuller reference will be made later.

Section A discussed a variety of subjects on September 11th, and so completed its Sectional Programme for this year's meeting. Half the morning was devoted to a discussion on the scattering of electrons by crystals, in which Dr. C. J. Davisson and Prof. G. P. Thomson were the principal speakers.

Some new experiments on supra-conductors formed the subject of a paper by Professor W. J. de Haas, of Leiden, Holland. Among the other papers before Section A may be mentioned one by Dr. G. Green, who dealt briefly with the theory of the condenser telephone—a telephone whose response curve shows gradual changes. There was not sufficient time for him to deal with the matter at any great length, but he extended an invitation to all interested to discuss it with him later in the day.

One of the questions discussed by Section F (Economic Science and Statistics) was that of hours in industry. A paper on the subject was read by Mr. L. C. Robbins.

The programme of Section G (Engineering) contained much of interest on the electrical side, and included papers by Prof. W. Cramp on "The Possible Application of High-frequency Power for Electric Traction" (abstracted in our last issue); by Mr. B. Hague, on "Experimental Methods for Determining the Distribution of Electric and Magnetic Fields"; and by Dr. J. Hartmann on "The Jet-wave and its Applications."

Electricity in its application to botany was discussed in a paper before Section K (Botany) by Prof. H. H. Dixon, F.R.S., and Mr. T. A. Bennett Clark, on "The Influence of Temperature on Response to Electrical Stimulation." In this paper the evidence is discussed for the belief that a sudden change in the electrical conductivity of a tissue is due to a proportionate change in the permeability of the constituent protoplasts to ions. The passage of an alternating current of sufficient voltage through a tissue causes a change in permeability which is the resultant of two reactions which tend to raise and lower the permeability respectively; positive reactions exceed the negative when the duration is short; when the duration is long, the negative are greater. The position of the neutral point where both reactions are equal in magnitude affords a measure of the sensitivity.

The developments in, and aims of, educational broadcasting were discussed before Section L (Education) in a paper by Sir John Reith, Director-General of the B.B.C., the paper being presented on behalf of Sir John by Mr. J. C. Stobart. In it the educational efforts of the B.B.C. were explained at some length. Though entertainment is the primary function of broadcasting, the educational and general cultural possibilities, it was pointed out, are recognised and developed. In the course of discussion it was stated that for quite a moderate sum, school sets can be obtained nowadays which are perfectly simple to operate, and which require no more than the pressing of a single switch to give results which are adequate both as regards tone and volume. The problem of maintenance, it was pointed out, can be reduced to its simplest form by using the electric light mains. For the purposes of demonstration, two rooms adjoining the meeting rooms of Section L were fitted up as a model studio and a school classroom respectively. There were also on view models of receiving sets suitable for schools and adult study groups.

September 12th, the closing day of the meeting, was not a very busy one. To the members of Section G a report was to have been presented by the committee which was formed two years ago to deal with the question of electrical terms and definitions, but in fact no report was prepared, due to some differences of opinion having arisen with regard to the definition of fundamental electrical terms. The formation of the committee was the outcome of the publication by the British Engineering Standards Association, in 1926, of its glossary of terms

used in electrical engineering. Prof. G. W. O. Howe, being somewhat alarmed at the inconsistencies in the definitions in the glossary, submitted a paper at the Oxford meeting in that year, and following this the committee was formed. The purpose of the discussion on Wednesday, therefore, was to obtain the views of physicists and electrical engineers on the points in regard to which difficulties had been encountered. There was a mathematical discussion on some of the points at issue, which itself served to indicate the differences of view which exist, though the atmosphere of the discussion gives ground for the hope that ultimately agreement will be reached.

Two papers of general interest were read before Section F (Economics). The first was by Major L. Urwick, who discussed rationalisation and industrial education. One of the many points which he raised was that of the universality of management problems, and at the same time the variety of syllabuses existing for the teaching of the subject. The question whether or not an agreed standard was possible, and how it would appeal to employers, was discussed. The help which could be given by an institute of industrial management was also stressed.

The second paper before this Section was by Mr. C. Le Maistre, Secretary of the British Engineering Standards Association, who dealt with the problem of standardisation in industry. We do not wish, he said, to merge our individuality in too much standardisation, nor to give up our right to a certain amount of scope for selection. In fact, whilst experience shows that industrial standards, arrived at nationally, which provide an equitable basis of comparison, be it for quality, performance or tests, are invaluable aids to economic production, and tend to simplify commercial transactions, there is no doubt that too much simplification and standardisation of particular articles has the danger of leading to sterilisation.

Next Year's President.

Sir Thomas Holland, K.C.S.I., F.R.S. (Rector of the Imperial College of Science and Technology), has been elected President of the Association for the meeting to be held in South Africa next year. Sir Thomas has been identified with the Association since 1898, and has achieved a world-wide scientific reputation through his work in the field of mining research. Many of his activities have had their centre in India, where he has rendered great public services.

High-pressure Water-tube Boilers.

By H. E. YARROW.

(Abstract of a paper read before Section G.—Engineering.)

IN reviewing recent developments in boiler design, the increase in steam pressures and temperatures is one of the outstanding features, and there has been considerable progress along this line in recent years. The demand for cheap electric power has resulted in a much-improved overall efficiency, due partly to the boiler and superheater delivering steam at such pressures and temperatures as can be used more efficiently, as well as by reducing the temperature of the escaping gases, thereby utilising more of the heat in the fuel.

The progress made by steam plants within the past decade, and their prospects for the future, are concisely shown by the curves in fig. 1, which present reductions of graphs originally given by Professors Mellanby and Kerr. In fig. 1 the thermal efficiencies reached and considered ultimately attainable for land plants of a high class are shown in a general way. Points marked A and B are representative of the best practice in 1918 and 1928, respectively, while the terminal point C on the curves indicates the ultimate limits considered by these authors to be possible to steam plants by the full exploitation of high pressures and temperatures, the best features of the modern steam cycle, such as reheating and feed-heating, and the development and employment of the best materials of to-day.

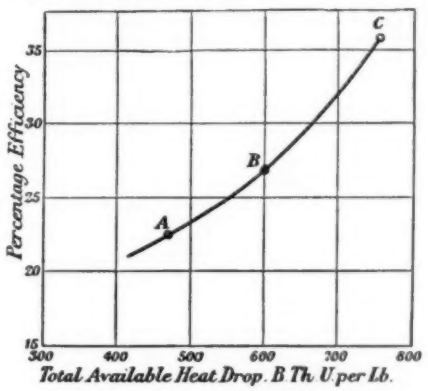
Increased pressure involves increased expansion and, in order to meet the wetness difficulty, the maximum initial superheat or reheating is necessary. In order, therefore, to utilise steam to the best advantage, temperatures as well as pressures must be increased so that the overall efficiency of the plant is improved.

There are now installations in operation at pressures exceeding 1,250 lb. per square inch which are said to be working satisfactorily. Still higher pressures promise a slight thermodynamic gain, but probably too little to justify much advance beyond that limit of pressure under present conditions.

It has been estimated by the authors previously referred to that, taking as the "cycle limit," initial steam conditions of 1,250 lb. per square inch and 900 deg. F. with two re-heating and eight feed-heating stages, the consumption of about 0.37 lb. of oil or 0.56 lb. of coal per horse-power-hour might be expected. This is the value corresponding with the point C on fig. 1, and, although such low consumption figures are not yet commercially practicable, the time may not be far distant when these high efficiencies will be realised.

The building of super-power stations has resulted in boilers of very large capacity being constructed, and units evaporating 300,000 lb. to 400,000 lb. of steam per hour are now operating. There is a tendency to increase the rating of water-tube boilers for power-station work by reducing the steam generating surface and recovering the heat from the waste gases by other means, such as air preheating. This has the advantage of cheapening the first cost of the installation by reducing the high-pressure and, therefore, the more expensive, portion of the boiler equipment and replacing it by cheaper surface, such as air-heating surface, and thereby presenting a more attractive selling price to the purchaser. Although the steam generating surface may be reduced for a certain output, this reduction is made in the surface exposed only to convection, whereas the tendency is to increase, and not diminish, the surface exposed to direct radiation.

The higher the steam pressure the higher the temperature of water in the boiler and, therefore, a larger surface is required to reduce the temperature of the gases as compared to a low-pressure boiler. For this reason, also, it is more economical, from the point of view of capital cost, to allow the gases to leave the boiler at a comparatively high temperature and recover the heat in other ways.



	General Conditions.			
Reference Letter.	Pressure lb. per sq. in.	Temp. Degs. Fahr.	Reheating Steps.	Feed-Heating Stages.
A :- 1918	350	670	None	Two
B :- 1928	615	730	One	Three
C :- "Limiting Cycle"	1250	900	Two	Eight

Fig. 1.—Land Plant Efficiencies (Boiler-turbine-condenser System Only).

The design of the boiler cannot be dissociated from the kind of fuel that is to be used and the method of burning it. A large combustion chamber is advantageous to permit of complete combustion of fuel with less excess air, thereby raising the furnace temperature. A high furnace temperature gives the designer the opportunity of distributing the surface in such a way that a large proportion is exposed to direct radiation, an important feature in modern boiler design. Pulverised fuel has led to the adoption of still larger areas exposed to direct radiation by the addition of water-cooled walls, which are at a lower temperature than the fusing point of the ash that falls on them, thus preventing the formation of slag.

The heat leaving the boiler is, generally, in a modern plant recovered by air preheaters alone or by economisers and air-heaters together. In the case of burning pulverised fuel or oil, there appears to be no limit to the temperature to which the air may be heated and, therefore, the most economical arrangement would be to recover the heat entirely by air preheaters.

With mechanical grates an air temperature of 400 deg. F. is approaching the limit, if the cost of repairs is to be kept within a reasonable figure, although, with the introduction of heat-resisting materials, there is no reason why air temperatures considerably higher should not be employed satisfactorily.

With certain fuels the difficulty remains of ensuring the satisfactory disintegration of coal when fed in the solid form on to grates supplied with highly preheated air.

The necessity of rapid circulation in a modern boiler is obvious, so that the steam bubbles may be swept away as soon as they are formed. As the pressure increases, the steam bubbles become smaller and the circulation tends to diminish. Therefore, with high-pressure boilers, it is still more important that every encouragement should be given to the water to circulate freely, and tubes well inclined and as straight as possible are preferable. Trouble has been experienced in water-cooled furnace walls, due to faulty circulation, and the design of these connections requires most careful consideration.

Pure feed water only should be furnished to high-pressure boilers, as the rate of heat transfer in all water-tube boilers

is very rapid in the tubes exposed to direct radiation as well as convection, and the formation of any scale, due to impure water, leads to the over-heating and burning of the tubes.

As boiler pressures increase, so does it become more important to reduce, or if possible to eliminate, riveted and bolted joints and to adopt drums or headers of a circular section. Steelmakers are now able to supply hollow forged drums at a reasonable price and, although still more expensive than a built-up drum, it is desirable to adopt forged drums with riveted ends at pressures exceeding 500 lb. to 600 lb. per sq. in. At very high pressures of 1,000 lb. forged drums with closed-in ends can be used, in which case rivets are entirely eliminated. The finished article is machined both inside and outside.

Solid forged drums are made in steel of 28 tons to 32 tons, or a higher tensile steel of 34 tons to 38 tons; the latter material offers advantages, as it enables the thickness of the drum to be reduced.

On the Continent a large number of welded boiler drums for high pressures are now being supplied. Such drums are much cheaper than forged drums, and the further development and use of welded drums will be watched with interest.

The question of temperature does not seriously concern the designer so far as the boiler itself is concerned, because, even at a pressure of 1,000 lb. per square inch, the temperature of saturated steam is about 550 deg. F., which is still below temperatures which affect the strength of the material, although it must be borne in mind that the temperature of the metal of the tubes is higher. The effect of temperature has, however, a considerable bearing on the design of the superheater, and it is preferable to adopt reasonable steam temperatures at the superheater outlet and to add, if necessary, further heat by reheating the steam at one or more stages during its progress through the turbine.

Some tests recently carried out by Messrs. John Brown and Company, Limited, show the effect of temperature on three different descriptions of steel, namely, various carbon steels, a 3 per cent. nickel steel, and a nickel-chrome steel. Taking into account the effect of "creep," it would appear that temperatures of 750 deg. to 800 deg. F. are approaching the dangerous limit, if ordinary carbon steel is used. Materials, however, can now be obtained in alloy steel by which still higher temperatures may be worked to, and, if certain parts of the superheater—such, for instance, as the last passes in the steam passage—be made from special steel, higher temperatures may be adopted.

An interesting series of experiments was recently carried out at the works of Messrs. Brown, Bayley, to investigate the most suitable material for superheater tubes. Three samples were chosen; the first of a nickel-chrome-iron alloy, the second a chromium-iron alloy and the third ordinary mild steel. The experiments indicate that both the nickel-chrome-iron and the chromium-iron materials are highly immune to the attack of furnace gases and are, in this respect, superior to ordinary mild steel. Tests were carried out on the tubes by passing steam through them, entering at a temperature of about 750 deg. F., and leaving the tube at about 1,000 deg. F., the temperature of the tube itself being kept about 1,000 deg. F., by passing an electric current through it. The tubes of nickel-chrome-iron and of chromium-iron were found to be not attacked although the experiments were continued for several weeks. The result of the experiments with the mild steel tube was, however, unsatisfactory.

Assuming that such heat-resisting tubes can be manufactured at a reasonable price, it would enable higher steam temperatures to be used with safety.

It is not possible, within the scope of this paper, to deal with boiler mountings and other fittings that are subject to high pressures and temperatures except to emphasise the importance of good design and workmanship of all the accessories to the boiler. There does appear, however, scope for improvement with regard to the design of feed water regulators for high-pressure boilers so as to ensure an instant and reliable response to feed water demands and a constant water level irrespective of pressure fluctuations in the main feed. In this connection the adoption of a two-pressure stage boiler may be a possible line of development. The safety valve equipment also requires special consideration as the cutting action of high-pressure steam will quickly make a small leak between valve and seat serious. This is usually overcome by installing small pilot valves which give warning before the main valves lift, enabling the operator to prevent the main valves from coming into action too often. On the other hand, the steam fittings for high-pressure boilers can be made smaller than those for lower pressures, which is an advantage.

It is interesting to note that, in the case of recent vessels with steam turbines in conjunction with water-tube boilers, superheaters, and air-heaters, using coal on a mechanically-operated grate, a consumption of 1 lb. of coal per shaft horse-power is being obtained under service conditions, the coal being of a low-grade quality. A figure such as this presents a hopeful outlook in regard to the use of coal in the Mercantile Marine.

The utilisation of the coal resources of this country is of such importance that any development in the direction of improving the efficiency and economy of steam generating plants cannot be over-rated. While in electric power stations coal is more or less universally adopted, in the Mercantile Marine the use of oil in Diesel engines is a serious competitor. It is significant to note, however, that the recent development in higher pressure boilers and steam turbines has resulted in steam machinery, in combination with coal, being selected by certain shipowners in preference to oil engines.

Discussion.

Prof. A. L. MELLANBY remarked that although great advances were being made in the use of high-pressure boilers, there was still a certain amount of scepticism on the part of some people. There was a general opinion that it was possible to continue to increase the pressure and temperature and obtain increasing economy. That, however, was not the case. When they took into account the losses introduced by these high-pressure boilers it would be found that within a certain limit of range there was very little advantage, and, in his opinion, many people to-day were using steam pressures which were higher than the investigations at present justified economically. Although there was a tremendous number of high-pressure installations now in operation all over the world, he felt there was a tendency to go beyond what economy dictated. The question of materials at present limited pressures and temperatures. The pressure problem, however, was not so great as the temperature problem, the reason being that, in dealing with very high temperatures, the strength of the material diminished very rapidly when a certain temperature was exceeded. A rise of 10 degrees above the limiting temperature meant a considerable reduction in the strength of the material. Therefore, the materials problem was the one which required most attention. The use of high temperatures and pressures would mean the saving of the steam engine and turbine, but they should "gang warily."

Sir HENRY FOWLER, referring to the use of high pressures and temperatures in boilers for locomotive work, said it was obvious that there was economy in fuel consumption, and, in spite of the difficulties, locomotive engineers were looking to high pressures. Unfortunately, it was not the technical side which was the difficulty; it was the commercial and economic side. It was appreciated that if these high pressures were used, a turbine must be employed, and on a locomotive that involved many difficulties and a great deal of money. The tubes in the 1,400-lb.-pressure Schmidt-Henschel locomotive boiler were made of nickel steel; otherwise ordinary steel was used, and this boiler had run for 20,000 or 30,000 miles without any tube trouble, with distilled water.

Sir JOHN BILES said that pulverised fuel was being tried for marine work, and successful pulverised fuel firing had been carried on in a cylindrical boiler. On the other hand, Messrs. Yarrow had put down an experimental plant for using pulverised fuel on tubular boilers, which demonstrated one of the most advanced stages of this very important development. Whilst efforts were being made to utilise pulverised fuel in the cylindrical boiler, the future development of steam production and in the use of coal for marine purposes must follow on the lines of the water-tube boiler and turbine. There was no doubt about that, and he felt confident that the application of pulverised fuel for marine purposes would meet with success, which must be considerably to the advantage of the coal owner and at the same time rapidly lead to very high efficiencies in coal consumption in the Mercantile Marine. The Department of Scientific and Industrial Research had appointed a committee, in conjunction with its own staff, to apply on board a ship lent by the Admiralty any method of pulverising fuel for cylindrical boilers, so that the relative merits of the different systems could be tested.

The PRESIDENT remarked that a large number of welded boilers were being made, and in America he was surprised at the wonderful work that was being done in this connection. He drew a curve to show that 750 deg. F. was about the boundary line of tensile strain with ordinary mild steel, and for that reason he argued that the problem was not so much one of pressure as one of temperature. It was no use thickening everything up to take pressure if there was going to be "creep" above a certain temperature.

Mr. W. MARRINER spoke in favour of solid weldless drums for high-pressure boiler work. In addition to the advantages to be obtained on board ship by the use of high pressures, *qua* the boilers themselves, he said, there were incidental advantages accruing to the ship generally by the small amount of coal to be carried, so that the use of high-pressure boilers should enable the ship designer to gain considerable advantages in many other directions. He was convinced that boilers would be used on ships at much higher pressures and temperatures than those of to-day.

Prof. F. C. LEA said that the important thing to know in relation to the use of high steam pressures and temperatures was what would be the strength of the material with time, *i.e.*, in actual operation. Experiments had shown that a material which had a strength of 20 tons at, say, 500 deg. C., after a time was reduced to 5 or 6 tons, and that was what was meant by the limiting creep stress. In the case of the ordinary steels corrosion was a serious problem as affecting the life at high temperatures. Special anti-corroding steels were being made which were very much better than the carbon steels, and these steels had better properties for resisting high temperatures, provided the temperature was kept below 800 deg. C. At that figure, recent experiments had shown that even some of the best steels for resisting high temperature would, at a temperature of 800 degrees, have their strength reduced from, say, 15 tons to 2 tons in 53 weeks, and he had estimated that in 1¼ years the strength would be reduced to one ton per square inch.

Mr. YARROW briefly replied.

Suggestion Schemes.

By Mr. S. MAVOR.

(Abstract of a Paper read before Section F.—Economics.)

The full title of this paper, to which we have already referred, was "Suggestion Schemes as a Means of Promoting Co-operation of the Worker in Industry." The author said that it had been complained, on behalf of the workers, that under modern workshop conditions they did not have opportunity for self-expression. While the studies devoted to the machinery and methods of engineering production in recent years had yielded remarkable economies, the human factor as an element in production had been comparatively neglected. The application of a suggestion scheme was one of the best means of making available for production the full potential contribution of the workers. Almost any departure from established practice which directly affected the personnel—not only the manual workers—encountered at its initiation indifference, scepticism, mistrust and passive resistance. Even modern foremen with proper conceptions of their functions, might be reminded that one of their primary duties was to utilise in production as effectively as possible the potential powers, both mental and physical, of the men and boys placed under their direction. The next step was to explain to the workers or their representatives the proposed scheme, making plain its purpose and describing the prospective benefits, monetary and other, to the workers and also the advantages to the firm, to the industry, and to the community. Without the existence of works committees, especially to deal with the minor difficulties that were inevitable in the early stages, it would hardly be possible to pilot the scheme to success. There was probably no other industry like engineering in which the workmen had greater opportunities for conscious self-expression in original creative and constructive work; the following considerations referred primarily to that industry. The main lines of development of designs and of workshop methods were laid down by the technical staff—the thinking department. Although the workmen were not technically qualified to initiate major improvements, their intimate contact with materials at the various stages of production gave them unlimited scope for applying their intelligence to the saving of time and materials, and for improvement in detail of the products. The problem of improving efficiency in production was the problem of eliminating or reducing waste—waste of time, effort, and material. Individual workers had innumerable opportunities, many of them within the capacity of all, of suggesting how economies might be effected. When workers saw their suggestions carried out in promotion of orderliness and of safety, they felt that they had contributed to a raised standard, which they had a personal interest in maintaining. The actual submission of suggestions should be made as easy as possible, so that the ideas of those unaccustomed to the use of pen or pencil might not be suppressed for the lack of facilities to express them. In each department blank forms should be provided in a receptacle available to every worker, and, when required, assistance in formulating the suggestion should be readily forthcoming. It was doubtful if adjudication by a committee on which the men were represented was to be preferred to treatment of the suggestions by the works manager or a director.

In cases of rejection the suggestor should be interviewed by a member of the staff, the reasons for non-adoption clearly explained, and encouragement given, especially to beginners, to try again. Every worker in an establishment, of whatever grade, who co-operated in a suggestion scheme, had the satisfaction of seeing his ideas put to practical use, and of directly profiting from their application; he became consciously a part of the productive organisation, for by his constructive effort he had in some way made an original contribution to the general result, and his work acquired a new meaning. Although suggestion schemes ministered to a human need of the workers and gave scope for mental activities that were not prompted solely by material gain, they must bring material benefit to the workers as well as to the employer. At first the direct monetary payment was the chief stimulus to the making of suggestions, but later, while the external stimulus of direct reward must be continued, it was no longer the primary motive. It was recommended that the term *payment* be used as the term for remuneration, instead of *award*, which had a flavour of patronage. The precise valuation of a large proportion of the suggestions submitted was impracticable, and in fixing the amount of the payments the difficulty was to maintain consistency and some approach to just relativity. If the men had confidence that the adiudicators were doing their best to be fair and just, the results were generally accepted. Payments for suggestions should err on the side of liberality, and they should be made as promptly as possible. To illustrate the paper some notes on the working of a comparatively successful scheme were given. The scheme had been in existence for twelve years, but only during the last three years had much progress been made, the increased activity being chiefly due to the management keeping the scheme prominently before the workpeople. The number of suggestions submitted in the first eight months of the current year had been 1,667, equivalent to a rate of 2,500 per annum. The proportion of adopted suggestions to the total submitted was 42 per cent; of unadopted 48 per cent.; and of anticipated 10 per cent. The ratio to the total number of workers, of those who had made one or more suggestions, was 69 per cent. Five suggestions on the average were submitted per suggestor; the average payment per suggestion was 13s. 4d.; the highest direct payment for a suggestion in the current year was £10.

The competitive position of our export industries required that we should develop and apply all the means at our disposal for improvement of quality and reduction of cost of our products. Increased wages would further improve the relative position of the British worker must be earned by increased individual production; suggestion schemes provided a means of doing this without raising an additional bead of perspiration on the brow of any workman.

The Scattering of Electrons by Crystals.

Discussion in Section A.—Mathematical and Physical Sciences.

Opening a discussion upon the above subject on September 11th, Dr. C. J. DAVISSON said that experiments revealed that the interaction between a homogeneous beam of electrons and a crystal of nickel was similar to the interaction between the same crystal and a beam of monochromatic X-rays; the electron beam was regularly but selectively reflected from the face of the crystal (analogue of the Bragg X-ray reflection phenomenon), and at critical speeds of bombardment beams of electrons issued from the incidence side of the crystal in other directions as well (analogue of the Laue X-ray diffraction phenomenon). Unlike the Laue beams, however, the electron beams did not proceed from the crystal in the direction of regular reflection from its principal sets of Bragg atom planes. That this simple geometrical relation obtained in the case of X-ray diffraction was due to the fact that for X-rays the indices of refraction of materials were equal sensibly to unity. It was due to this circumstance also that the wave-lengths of Laue beams could be calculated by means of the Bragg formula.

Prof. G. P. THOMSON said that the passage of cathode rays through thin films of metals or celluloid resulted in a diffraction of the de Broglie waves associated with the electrons. This gave rise to a pattern similar to that formed by X-rays under the same conditions, and the whole of the pattern could be predicted with an accuracy of about 1 per cent. from the known crystal structure of the solid and de Broglie's expression for the wave-length. This had been proved by workers at Aberdeen University for celluloid, aluminium, gold, platinum, silver, copper and tin. The electrons which formed the pattern had apparently the same speed as the original cathode rays. Rupp in Germany extended those results to the cases of slow electrons of about 300 V, and found a small discrepancy which he ascribed to a refraction of the electron waves. A point of great theoretical interest was the length of the train of waves associated with an electron, and the question of the relation to each other of the waves associated with the different electrons in a beam of cathode rays. The Aberdeen experiments appeared to show that each electron had a coherent train of at least fifty waves associated with it. The number probably depended on the conditions of experiment.

Experiments on Supraconductors.

By Prof. W. J. DE HAAS.

(Abstract of paper read before Section A.—Mathematical and Physical Sciences.)

The theories on electric conductivity may be divided into two groups. The one treats the metal as containing a gas of electrons—degenerated or not. According to the theories of the other group, the electrons are passing from one atom to the other. The author thinks that the last point of view is the right one. It is possible to demonstrate that in graphite placed in a magnetic field nothing can be detected of a Lorentz force on the electrons. Other investigations on bismuth contradict the results obtained with graphite. The experiments are not yet conclusive. However, Kamerlingh Onnes made a very interesting experiment with a supraconductor. A wire of copper covered with a very thin sheet of tin and placed in a cryostate at the temperature of liquid helium shows supraconductivity at the ordinary threshold value of the temperature. Hence the electrons do not pass from the tin to the copper. There is no internal friction, as in a gas. There are still new phenomena difficult to understand under the assumption of a gas of electrons. It is a known fact that when a supraconductor is cooled down to the temperature of liquid helium a magnetic field may restore the ordinary qualities of conduction in the metal. Later experiments show that this phenomenon is a real hysteresis phenomenon. The resistance of the metal does not return at the same value of the field at which it vanishes. Now a phenomenon of hysteresis is something of a memory of matter. And all things occurring in time must statistically occur also in the volume of the metal. It is necessary that quite a lot of electrons be involved in the process of hysteresis. It seems possible that the hysteresis is made by a row of electrons passing rows of atoms. Why do the electrons pass in rows in a supraconductor? The author thinks that the phenomenon of supraconductivity has something to do with the zero-point energy. Nature gives in a supraconductor an example of a hidden and profound synchronism only possible with very regularly built atoms.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this Section.

A General Utility Machine.

The "Lindy-Stow" machine, fig. 1, which is being marketed by The Rothermel Corporation, Ltd., 24 & 26, Maddox Street, Regent Street, W.1, is a flexible-shaft electrically driven equipment which is made up in three standard sizes, ¼-, ½- and 1-h.p., as a general utility machine. Various attachments are provided so that it can be used for drilling, screwdriving, nut-

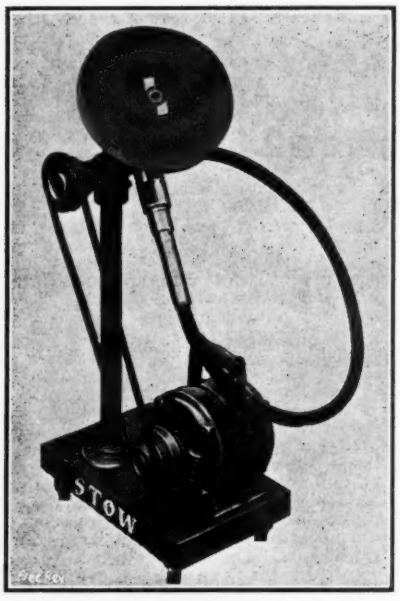


Fig. 1.—"Lindy-Stow" Machine.

setting, sanding, grinding, polishing, burnishing, and so on. The sanding disks provide a rapid means of stripping off old paint or preparing the virgin surface of the body to be treated prior to "priming" or "filling." The flexible shaft is the product of the Stow Manufacturing Co., the original patentee and manufacturer, it is claimed, of industrial flexible-shaft drives.

A Battery-charging Set.

The accompanying illustration, fig. 2, shows a charging set, without switchgear, which has been introduced by Messrs. Newtons of Taunton, 6, Grape Street, Shaftesbury Avenue, W.C.2. For d.c. supply the equipment consists of a motor and generator coupled in line and fixed on a common bedplate. Independent field magnets give the advantage that the generator voltage can be reduced as much as required by simply inserting resistance in the circuit of the exciting coils. The generator is provided with a "compound" or series winding

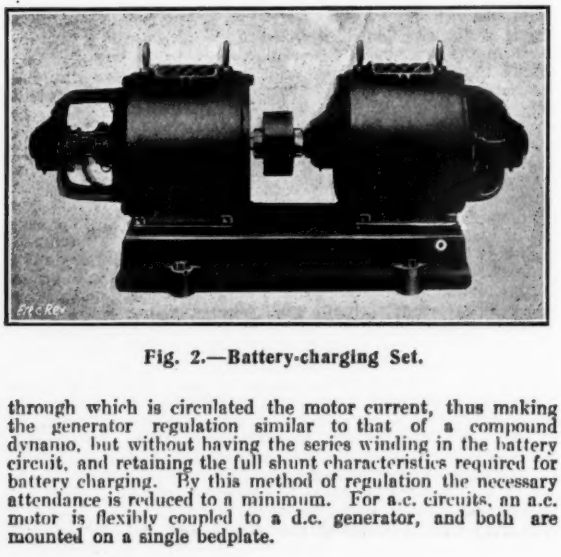


Fig. 2.—Battery-charging Set.

through which is circulated the motor current, thus making the generator regulation similar to that of a compound dynamo, but without having the series winding in the battery circuit, and retaining the full shunt characteristics required for battery charging. By this method of regulation the necessary attendance is reduced to a minimum. For a.c. circuits, an a.c. motor is flexibly coupled to a d.c. generator, and both are mounted on a single bedplate.

An Ozone Set and Fan Combination.

The "Viozone," fig. 3, is a combination of an ozone generating set and a fan which has recently been introduced by Messrs. Viozone, Ltd., 19, Cursitor Street, E.C.4. It is so designed that the fan will circulate the ozone produced by the other component, and the air in a room of 5,000 cu. ft. can be, it is claimed, purified in four minutes. The apparatus, which

Fig. 3.—The "Viozone."

Fig. 4.—Non-Battery Electric Torch.

can be connected to an ordinary lighting or domestic circuit, is supplied with a 4-way switch, one for the ozone only, one for the fan only, one for both, and the fourth, for "all off." The set is made for voltages from 110 to 250 V, and is suitable for operation on a.c. or d.c.

A Novel Electric Torch.

The above illustration, fig. 4, is of the "No-Battery" torch which is being sold by Messrs. Cunliffe, Hillstead, Macdonald & Co., Ltd., 6, Duke Street, St. James', S.W.1. It houses a compact dynamo, 2½ V, which is driven by a small spring motor. The motor is wound simply by turning the stem of the torch. A button is provided for the lamp circuit in the usual way.

Heald Cord Cable.

Probably most of the "breakdowns" which occur with domestic electric appliances are due to the rough usage of the flexible leads at the points of connection. In order to over-

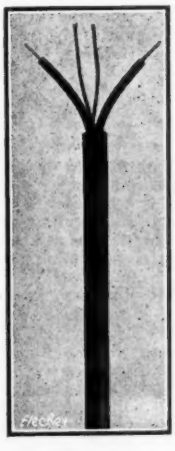


Fig. 5.—Heald Cord Cable.

Fig. 6.—Application to 3-pin Plug.

come this difficulty Messrs. Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, E.C.4, have introduced c.t.s. flexible cable with "Heald" cord strengtheners which pass underneath the sheathing and throughout the entire length of the cable. The cords are tied to the apparatus or connector so as to take the strain off the conductors. Fig. 5 shows the construction of the cable and fig. 6 its application to a standard 3-pin plug.

The Machine Tool Exhibition.

Some of the electrical features of the exhibits at the Fourth Machine Tool and Engineering Exhibition at Olympia.

(*Concluded from page* 460.)

Heat-treatment, of course, plays a very important part in the manufacture of tools, and in this connection the electric furnace has decided advantages. On the stand of Messrs. Wild-Barfield Electric Furnaces, Ltd., a full range of Wild-Barfield electromagnetic hardening equipments is being shown in operation; Messrs. Charles Taylor (Birmingham), Ltd., are hardening parts of their chucks in a vertical-type furnace, as installed in their works at Birmingham, on the stand, and Messrs. Lehmann, Archer & Co., Ltd., are using a horizontal type of furnace for tool hardening. A new model of the vertical-type furnace is shown; this has a chamber 16 in. in diameter and 28 in. long, and is specially designed for the correct hardening of gear wheels and similar parts. Fig. 14 shows an interesting example of this type of furnace. It is claimed to be the largest electromagnetic furnace yet built; it has a chamber measuring 16 in. in diameter and 56 in. long. It is provided with a control board, accommodating the magnetic indicator, regulating resistance, and main switch and

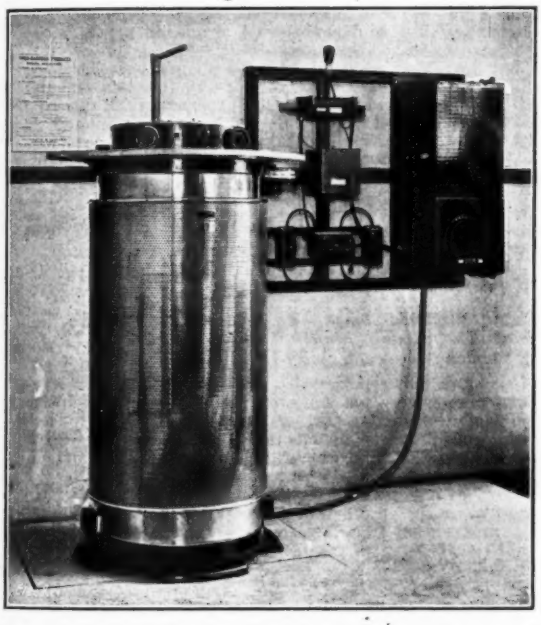


Fig. 14.—Vertical Electromagnetic Furnace; 22-kW, 230 lb. per hour.

fuses. The loading is 22 kW for an output of 230 lb. per hour. The furnace has been constructed by arrangement with Allgemeine Elektricitäts-Gesellschaft, Berlin, for Messrs. Flottmann A.G., of Herne, Westphalia. A feature of this exhibit is an internally-heated furnace suitable for carburising, annealing, enamelling, and so on. This is entirely automatic in operation, the temperature being controlled by an adjustable regulator, while the time of heating up or shutting down is regulated by a time switch. Two new types of high-speed steel-hardening furnace are also shown, the current consumption of which has been considerably reduced. To overcome the usual disadvantages of carborundum heating elements, owing to the great increase in resistance with age, a patent ballast resistance is fitted which extends the life of the elements. Two types of electric tempering ovens are also to be seen.

The British Secheron Co., Ltd., is showing two welding machines, both of which are specially designed for working on alternating current. The design of one, an arc-welding machine, incorporates a special device for stabilising the arc throughout the working range of the secondary current. It is suggested that there is no other machine on the market giving such a large range on the secondary side in which this stability can be obtained. The machine can be used for arc-welding sheets down to 1/16 in. in thickness. The other machine, a "Universal" welder, is designed as a general-purposes repairs and maintenance unit for all types of works. Some very interesting results have been obtained on this machine, such as the welding of brass and spot-welding copper to steel.

To attempt to select from the small electric hand tools on view on various stands is a difficult matter—the designs of such appliances as electric hammers, saws, drills, polishers, and so on, are so many and varied, each perhaps with some distinctive and novel feature of its own. Among the firms showing such equipment may be mentioned The B.E.N. Patents, Ltd., and The Sun Electrical Co., Ltd. The first-mentioned firm is also showing an interesting range of pedestal and bench-type electric grinders. All the electric tools sold by this company are fitted with Westinghouse electric equipment and S.K.F. ball bearings. Among the heavier equipment shown by the Sun Electrical Co. is a universal drilling machine which may be mounted on a bench, suspended from a girder or attached to a wall.

Messrs. H. C. Slingsby are showing a range of automatic electric trucks, including load carrying trucks, elevating platform trucks for loads up to tons, lifting-tiering trucks, railless truck trains, and electric industrial engines, railless and for railways.

Messrs. Reavell & Co., Ltd., have arranged on their stand a comprehensive range of electrically-driven compressors, in connection with which the following new developments are of interest. The fitting of the QR-type quadruplex compressor with roller bearings is a comparatively recent innovation and has proved itself justified by the remarkably small amount of wear which is found after the machines have been running for a considerable period. The H.C.S.A.-type compressor is a two-stage high-pressure machine which has been evolved from the single-stage single-acting compressor.

The Lucigraph photographic copying machine is to be seen on the stand of Messrs. Alfred Herbert, Ltd. The "Lucigraph" is a self-contained machine for making photographic copies directly on sensitised paper, of drawings, printed or written documents. This is accomplished by the use of a reversing prism in front of the lens, which also allows the object to be copied to be placed in a horizontal position. The machine exposes the print, cuts it off from the roll, develops and fixes it. Any required amount of reduction or enlargement can be obtained, within the limits of the machine, by various arrangements of the pointers. A chart is supplied with each machine to enable correct settings to be obtained. The illumination for copying is provided by two mercury-vapour lamps, which for ordinary work are located so that the tubes project along each side of the table. These lamps give a uniform light along the whole length of the table.

On the stand of Messrs. R. A. Lister & Co., Ltd., is a complete 1-kW lighting set specially suited for the illumination of small country houses, churches, and so on. It consumes only 1.5 pints of petrol per hour on full load, and 1 pint of lubricant per 125 running hours. The set consists of a power unit, dynamo and switchboard. The power unit is a "Lister" single cylinder, vertical, water-cooled 4-stroke petrol engine of the totally enclosed design with automatic lubrication. It is fitted with a pulley to drive other machinery if desired. The dynamo is of a special 4-pole protected design, with a ball bearing at the commutator end, and the armature is rigidly bolted to the engine flywheel, the direct coupling thus eliminating a bearing on the driving side of the dynamo. It is shunt-wound for battery charging purposes, and is also provided with powerful series starting windings, enabling the plant to be started from the battery. The dynamo is designed to give its rated output at all voltages between the minimum and maximum, and is built for continuous running. The switchboard is mounted on supports from the dynamo and has a cut-out designed specially for eliminating mercury cups and fine winding.

A number of firms are demonstrating the advantages of their particular systems of power transmission—rope, belt and chain driving, and so on. Among these may be mentioned Messrs. Frank Wigglesworth & Co., Ltd., who are showing their "Texrope" drive, and Messrs. P.I.V. Chain Gears, Ltd., who have on display several examples of P.I.V. chain gear driving.

Messrs. Bertram Thomas are showing their "Tiltrack" system of stores fittings. These consist of steel vertical standards suitably spaced and braced, and upon rails or arms attached to these standards are stacked steel container trays. The rails or arms are slanted downwards to the front, so that the trays are tilted, exposing their contents to view. The front of the supporting rails is turned up to provide a stop, which prevents the trays from falling out, but any tray can be removed from its position in an instant by lifting its front edge over the stop, and allowing it to slide forward. The equipment is in sections, and new sections can be added as required without disturbing the existing fittings. An interesting development of the "Tiltrack" system, also on show, is the "Tiltrack" truck. This consists of a section of "Tiltracks" supported by a steel framework and mounted on swivelling castors, enabling the whole to be wheeled or turned in any direction. The trucks can be brought right up to the job or wheeled right into the stores.

On the stand of the Reliance Telephone Co., Ltd., the G.E.C.-Automatic private exchange telephone systems are represented by a 25-line and a 50-line exchange units. The design of this equipment allows for the incorporation of

such special facilities as executive control, secretary's service, fire-alarm service, conference lines, code call, loud-speakers, and so on. Although the company supplies any apparatus separately, it makes a feature of providing complete installations, which can either be purchased outright or rented; in the latter case an efficient service is given, including all repairs and renewals due to fair wear and tear.

Among a number of interesting items on the stand of the IGRANIC ELECTRIC CO., LTD., is a control panel equipped for inductive time limit control, a system recently introduced with a view to overcoming the disadvantages pertaining to the time-limit and current-limit systems. Under the new method the timing of acceleration depends upon the rate of change of the accelerating current and of the motor e.m.f. By adjusting the equipment for average load conditions the torque and accelerating currents are maintained at normal values for average operating conditions, yet heavy peak loads are accelerated, it is claimed, just as satisfactorily on the same adjustment. On light load the motor is accelerated in the minimum time consistent with safe operation of the machine, gearing, and so on. All these features lead to increased speed of production from the driven machine and, of course, increased protection of the motor, because it is impossible for a stalled motor to remain connected to the line until its windings reach a dangerous temperature. The controller is of robust and simple construction, without dash pots and current relays, and with the barest minimum number of auxiliary or interlocking contacts. The apparatus should have a special field of application in connection with the control of steel mill auxiliaries and similar plant.

This firm is also showing a system of control for large steam and water valves and a model of the electrically-operated newspaper conveyor installed at the *Daily Mail* London printing offices.

Messrs. STERNOL, LTD., are showing various samples of lubricating, high-speed cutting and quenching oils, and so on.

Although, of course, not electrical, a particularly interesting section at Olympia is a historic exhibit by the MACHINE TOOL TRADES ASSOCIATION, which includes a planing machine made by Richard Roberts in 1817, a model of John Wilkinson's boring mill, 1775, and a bench drilling machine by Nasmyth, 1840.

Referring again to the exhibits of the CAMBRIDGE INSTRUMENT CO., LTD., the illustration on p. 460, fig. 10, is of a surface pyrometer for taking the temperatures of non-ferrous metal billets and also for measuring the temperatures at a number of points on a large surface. It does not utilise the strip form of thermo-couple, which is replaced by two sharp metal prongs, embodying the wires forming the thermo-elements, and protruding from a cylindrical barrel, the actual thermo-junction being completed by the surface of the metal against which the prongs are pressed. One prong normally projects further from the barrel than the other, and is kept in this position by a spring, so that definite contact of both prongs is ensured even when applied to rough or uneven surfaces. The instrument with the strip form of thermo-couple is used for measuring the temperatures of small ferrous billets, such as the steel billets used for files, &c.

Reviews.

Costs for Manufacturers. By CHARLES SMITH. Pp. viii+90. London: Sir Isaac Pitman & Sons, Ltd. Price 5s. net.

How pleasant the task of the reviewer for the Industrial Press who finds a book contributing some real and valuable addition to the technical library! How pleasant to be able to give real and unstinted praise where praise is due! A review, if it is to serve any useful purpose, must serve as a true and reliable guide to the reading public, indicating which books it may buy and read with advantage; which will offer it help and guidance, ideas and food for thought, and on what particular subject. If a book does not offer such advantages, what alternative has a conscientious reviewer but to say so?

What is very evident from Mr. Smith's description is that none but a very prosperous firm could afford to carry out many of the policies of expense distribution adopted by him. It is stated that if a machine breaks down, or is for some other reason forced to be idle for 96 hours, the expense of that machine for the lost time should be spread over its future production, for a period which will rest with the discretion of the management.

As Mr. Smith says, it is obvious that the costs of the orders that have already gone through are too late to share in this breakdown loss; and we agree, but are ourselves at a loss to understand why any one machine should cost more to run just after it has broken down and been repaired than before such an unfortunate occurrence. We use the word "unfortunate" purposely, for it would appear from page 33 and thereabouts that costs are made to vary almost directly with the skill of the Sales Department! For instance, "the unit rate (of expense for any one machine) is proportionately increased for any serious (over 12 hours or so) occurrence of idle time," and again, speaking of overtime, "increased hours of working correspondingly reduce the unit rate."

Evidently the less successful the salesmen are in obtaining orders so as to provide work for a certain machine, the higher becomes the cost of working that machine, and since Mr. Smith lays it down that in the case of an extensive stoppage it becomes a question for the sales manager to decide upon an increase in the price of the goods, we could anticipate many difficulties, excepting in the case of very profitable concerns. Just imagine for one moment the appointment of Mr. Smith as costing expert for the cotton industry, and its adoption of his dogmas. "The unit rate of expense of all spindles and all looms is proportionately increased for any serious occurrence of idle time, and the sales managers must decide upon an increase in price." How simple and complete a solution for all poor Lancashire's distress! How stupid of them not to have thought of it themselves! What would the Italian and Japanese and other competitors do then?

Quite apart from the amazing anomalies into which this "policy" of dealing with idle capacity, time lost through other causes, and overtime, leads one, why on earth should the cost per hour of running any one machine vary because orders are plentiful or few, or because the similar machine installed next to it is idle or busy? Such a policy is indefensible, it isn't costing at all, but merely a convenient wangle so as to obtain that fetish of the accountant—a balance! No intelligent salesman can ever rely for long on such results, and, as for the more valuable side of costing, the information costing can give to the works about efficiency and increase or decrease in cost for this and that reason, Mr. Smith's figures are utterly valueless.

Now let us consider the outstanding feature of the book, for the publication of which this volume was apparently written, namely, the basis of expense distribution. What Mr. Smith wants to do is to allocate all establishment charges (or overhead expense) to departments and machines in accordance with the floor space they happen to have had devoted to them! To find why Mr. Smith wants to do this, we searched in vain in his book! All he says in introducing this one underlying feature of his system is "Working expenses are a time charge on industrial manufacture and their proper allocation is . . . in the exact proportion of working space that is occupied by the producing factor. . . ." Absolutely no explanation or reasoned argument is offered for this amazing plan.

Mr. Smith does not even stop at distributing manufacturing expenses on this basis, he goes "the whole hog" and distributes commissions, rebates, discounts, patents, and a whole list of other perfectly irrelevant expenses in accordance with the floor space occupied by each machine.

Mining Electrical Tests. By E. DINSDALE PHILLIPS, Editor of *The Mining Electrical Engineer*. Pp. 32; figs. 14. London: Messrs. Evershed & Vignoles, Ltd.

This work is intended as "a practical guide for the mining electrical engineer." It will prove useful in a much wider field—in fact, the greater part of its contents will apply to the testing of electrical installations generally. In text-books and most published work dealing with electrical tests, there is an absence of the meaning of electrical tests. The actual tester does not always, perhaps not often, realise that identical test results on different installations, parts of an installation, or classes of apparatus frequently indicate vastly different conditions from the practical point of view. There is an attempt in this book to create the idea of the meaning of tests in the mind of the tester, and for that reason it is particularly welcome. Many works on testing amount to a mass of diagrams of test circuits; in this book there is not one. It is essential for the tester to understand what is actually happening when he is making a test, and because of that it should be understood that the right place for the book is in the hands of the man versed in the technical side of electrical testing.

Again, it is noticeable that the book contains little information as to the instruments used for the tests referred to. As the publishers of the book are instrument manufacturers, perhaps this is a good thing—it certainly lifts the brand of "advertising matter" from the work; but we think it is a pity that the general principles of the testing instruments are not laid down. However, as in the case of the testing circuits, the information is readily obtainable from many text-books and other sources.

Your Car—How it Works. By A. G. D. CLEASE, B.Sc. Pp. 52; figs. 94. Price 1s. net.—**The Woman Owner-Driver.** By the HON. MRS. VICTOR BRUCE. Pp. 53; illustrated. Price 1s. 6d. net. London: Iliffe & Sons, Ltd.

These are excellent little brochures issued by *The Autocar*. The former explains the operation of the motor car in the simplest language, with a wealth of illustrations, cleverly devised to speak for themselves; it contains an admirable chapter on the electric ignition system, and another on the lighting and starting system. As an introduction to the subject, the booklet takes high rank. Similarly, in the other brochure the author, who is a recognised expert of very wide experience, teaches her sister motorists the fundamentals of good driving; but whilst one or two chapters are solely of feminine application and interest, the bulk of the contents is equally useful to beginners of either sex—and if her instructions were universally studied and applied in practice, it is safe to say that there would be fewer accidents, greater courtesy, and less inconvenience to the non-motoring public than under the existing conditions. We can heartily commend these hand-books to those who are new to the art of motoring.

Technical Data on Fuel. Edited by H. M. Spiers, M.A., B.Sc., F.I.C., on behalf of the Technical Committee, World Power Conference, 1928. Pp. xii+200; 24 figs. London: World Power Conference. Price 10s. 6d. net.

In view of the opening of the Fuel Conference of the World Power Conference on Monday next, the issue of this handbook is very opportune; it has been produced under the direction of a sub-committee (with Dr. E. W. Smith as chairman) of the Technical Committee, of which Dr. C. H. Lander, director of fuel research, Department of Scientific and Industrial Research, is chairman, and is intended to bring together in convenient form some of the information that is constantly required by fuel technologists and others concerned. The contents are not meant to be exhaustive—that would require a very large volume—and data that are readily available have not been included; in some cases precise information is unobtainable, but the best authorities have been consulted.

The first and largest section of the book (some 50 pages) is devoted to general information, including conversion factors for simple and compound equivalents in metric and English units, barometer corrections, hydrometers, temperatures by thermometer and pyrometer, gas-flow measurements, viscosity of water and gases, and flow in pipes. Next the properties of air, water, and gases are tabulated; the properties of steam and refrigerants follow, and a section on the flow of heat brings us to the middle of the book. The remainder of the volume is occupied by sections on metals and alloys, refractories, and fuels—gaseous, liquid, and solid.

Throughout the book the leaves are blank on one side, so that the user can conveniently add to the contents under the appropriate headings. Many of the illustrations are valuable charts and diagrams, including some nomograms. The text is not confined to tables, short signed articles by experts being included, as well as much explanatory matter, the selection and arrangement of which reflects great credit on the editor. That the hand-book, so ably compiled and issued under the ægis of so competent a Committee (on which electricity is represented by Messrs. R. T. Smith, R. P. Sloan, and C. Rodgers) will prove extremely useful to the engineer interested in fuel technology, of which the literature is so vast that short cuts are essential, is certain.

Correspondence.

Correspondents should forward their communications* as early as possible.** ***No letter can be published unless we have the writer's name and address in our possession.

High-pressure Salesmanship.

It is quite possible that other people feel somewhat like I do with regard to the leaderette which appeared in your issue of August 31st, in reference to "High Pressure Salesmanship," and the methods adopted by the salesmen of vacuum cleaner manufacturers, and do not feel justified in letting the matter pass without comment.

In the first place, I should like to make it clear that not more than ten per cent. of the vacuum cleaner salesmen in this country are employed by vacuum cleaner *manufacturers*. You have only to take note of the numerous types of vacuum cleaners that are being sold by means of house-to-house calls, to discover that at least ninety per cent. of them are imported. Consequently, the companies operating them are *not* manufacturers.

Your article, if taken literally (and I have no reason to think it is intended otherwise), is a somewhat scathing indictment of the methods of the British vacuum cleaner manufacturers.

The number of such firms can be counted almost on the fingers of one hand, and as managing director of one of the leading companies, I feel that an unfair and unwarrantable attack has been made upon us, for, if you inquire further into the matter, you will discover that all the salesmen of the British manufacturers are forbidden to go to the extremes alleged.

Under no circumstances do I support salesmen whose methods can be calculated as being brow-beating to housewives; but at the same time, it is a very evident fact that salesmen have to be very persistent, in order to convince many ladies of the value of a vacuum cleaner in the house.

There are still far too many people who think that a vacuum cleaner is a luxury. It is nothing of the kind. It is an investment, and a very profitable one at that; and for health reasons alone, is essential in every house, just as much as a gas cooker was considered essential before electrical cooking became a practical proposition.

In many districts where electricity is cheap, electric cooking *should* be the established order, yet it is frequently the exception; what is undoubtedly required now is "High Pressure Salesmanship," if reasonable progress is going to be made.

The staffs of power station engineers are now very helpful in demonstrating, and taking the utmost trouble possible to educate the public to the advantages and uses of electricity for all sorts of household purposes, but they only get hold of the willing ears, and these are only a very small proportion of the actual users in any district. The rest will remain in ignorance until they are influenced by their friends, or by "High Pressure Salesmen."

If this country is to progress, and the people are to have the advantages of modern inventions, forceful means have undoubtedly to be used in order to make them realise and appreciate what is for their good. We should fall many years behind the times if we waited for an unsolicited demand; the demand must be created by forceful methods.

In expressing your opinion of "High Pressure Salesmanship," you apparently overlooked how practically every important speciality was first got on to the market.

In your last paragraph, you suggest that the "pressure" expended by speciality salesmen upon householders who buy electrical appliances, has failed. With your great experience, you must know that nearly 90 per cent. of electric vacuum cleaners have been sold direct to the public through these salesmen. Ask any electrical dealer how many cleaners he sells merely through the public calling in for them. As a matter of fact, there is hardly a dealer in the country who will consent to stock a vacuum cleaner unless he is promised "High Pressure Salesmen" to dispose of them.

Hundreds and thousands of people would have remained in entire ignorance of the enormous benefit derived from the use of vacuum cleaners, if these people had been left to the tender mercies of the electrical trader, and had not been approached by the companies' salesmen direct.

Your statement, therefore, is not founded on fact. How many electrical traders do you honestly consider are capable of efficiently demonstrating a vacuum cleaner? Prior to the advent of the "High Pressure Salesman," a few progressive-minded people purchased vacuum cleaners, and with what results? Not ten per cent. even knew how to get the best out of the machine, and many still do not. My company receives letters daily, asking for help and advice, which should have been given by traders, so whenever possible, an expert salesman is sent to demonstrate the machine. Their reports are enlightening, and are responsible for the above assertion.

In return for the large discount taken by the trader, it is his plain duty to do this service, but he has failed lamentably, and this failure is possibly responsible for the slow progress made in the sale of such electrical goods.

H. A. Harrison,
Managing Director,
The Croydon Engineering Co., Ltd.

Croydon, *September 11th*, 1928.

[We have been obliged to shorten this letter, by eliminating irrelevant matter. We allude to the subject in a leaderette to-day.—Eds. Elec. Rev.]

Radio Valve-Anode Capacitive Resistance.

May I take this opportunity of thanking all those who have kindly entered into correspondence under the above heading? Looked at from the point of view of the original article, it could have been wished that the discussion had centred round the fundamental principles formulated therein, rather than the point whether a valve can be considered as a variable resistance or not.

With reference to "B.Sc., A.M.I.E.E.'s" remarks, which he bases on his definition of an a.c. voltage, if he reads the article in question he will see that I do not agree with his definition as being sufficiently concrete, and until some definite criticism is made of my own definition, showing under what conditions this might be considered incorrect, his remarks are inapplicable.

From Mr. Owen Harries's second letter it is quite clear that we are, as he says, at cross purposes. The fact that the valve is a form of variable resistance has been shown by Messrs. A. H. Johnson and H. H. Ryder. How complicated the form of variation is has been shown by Mr. Harries. Since, however, in my article, I suggested (page 228, first column) the possibility of certain limitations of the theory when applied to thermionic valves, there has so far been no information to disprove the theories expressed.

Ernest W. Braendle.

Blackheath, *September 15th*, 1928.

I regret that through an oversight in not signing my letter which appeared in your issue of August 31st, my name was omitted therefrom. Also I would like to correct a small error, *viz.*, in (2) first line "slope resistance" should read "slope resistances," implying both anode and grid slope resistances, and for "enters" read "enter."

In regard to the letter from Mr. H. H. Ryder in the same issue, may I say that his argument goes wrong in the line

Total impedance at grid volts $V_g = V_p/I_a + R$

because the valve resistance is also dependent on the plate potential, which is altered, making his final deduction incorrect.

Now with regard to the letter from Mr. A. H. Johnson in your current issue:—

(1) Will he accept the fact that the result is readily demonstrable on the premises indicated?

(2) Also that my previous (2), with above corrections, is an immediate corollary? It frequently occurs that a step-by-step method of reasoning applied to the functioning of an electric circuit obscures the real truth, which is better brought out by a more generalised mode of attack. I can assure Messrs. Johnson and Braendle that my generalisations are not incorrect, and further, that it is, as now also pointed out by Mr. Harries, misleading to consider the valve as a variable (total) resistance.

(3) Has Mr. Johnson considered the *meaning* of rectification? The case cited is not a case of rectification. The precise meaning of rectification is this, that the time integral of a current due to an e.m.f. whose time integral is zero, is not itself zero.

E. Fowler Clark, B.Sc., A.M.I.E.E.

Derby, *September 8th*, 1928.

A Relay for Water-heating Control.

I have in mind an arrangement which I am going to try in this town for controlling water heaters from a street-lamp circuit, so as to have some control of my load factor, and for this purpose I require a relay which will open the water-heating circuit when 230 volts is applied to the primary side, and will keep the secondary circuit open until the primary is switched off, when the secondary is to be switched on. The primary circuit supplied is a.c., 230 volts, 50 periods; the secondary supply is the same, and 5 amperes capacity in the secondary would be big enough. My scheme at present is being held up because I cannot get a relay under £2 or £3, and I do not feel inclined to pay any more than £1 if I order in lots of 25. Perhaps you would be good enough to put me in touch with any firms who you think would care to quote me. I am told that the fact that there has to be a shunt coil on the primary is responsible for the high price quoted, but seeing that a 10-ampere watt-hour meter can be bought for 25s., "ring" price, I really cannot see why there should be any difficulty in turning out the relay which I require.

H. Wilson.

Electricity Works, Ashford, Kent, *September 8th*, 1928.

Does it Pay to Acquire Knowledge?

I recently had handed to me a booklet entitled "Instruction in Engineering—Privileges of Citizenship Series No. 2," by Mr. G. H. Gater, Education Officer to the L.C.C. Mr. Gater, no doubt unconsciously, makes an impartial—and illuminating—contribution to the subject which has been receiving considerable attention recently in the "Correspondence" columns of the ELECTRICAL REVIEW, "Does it Pay to Acquire Knowledge?" Let me quote some sentences of Mr. Gater culled from here and there in his pamphlet: "Engineering is the most comprehensive, and at the same time one of the most fundamental, of all British industries." "This tendency towards a high degree of specialisation has developed rapidly in recent years." "The industry accordingly tends to require from the rank and file of its personnel more by way of concentration, intelligence, and adaptability than at any time previously." "On the manufacturing side alone the industry employs designers, test-room assistants, research workers, and the like, in large and increasing numbers, men who in varying degrees must combine practical experience in the industry with high scientific and technical attainments. Technical assistants are able to command salaries varying usually from £150 to £300 or £400 per annum, though in special cases as much as £1,000 may be earned, and for the more responsible posts in large undertakings salaries of a much higher order still are frequently paid." "The question naturally arises as to how a young man engaged in or preparing to enter the engineering industry should seek to fit himself for a position of responsibility, since an extended technical knowledge and scientific outlook is essential."

So much for Mr. Gater's words. Now may I be permitted to interpret them into solid facts, and give them their correct perspective? The engineering student after some seven or eight years' experience, his winter evenings all being taken up with study, finds himself on the first rung of the "technical assistant" ladder at a salary of £150 per annum. He must have a high degree of specialisation, an extended technical knowledge, intelligence, adaptability, and so on, and the "highly attractive" outlook to which he can look forward is £400 per annum. Let one who has been 22 years in the industry—with a B.Sc. degree to boot—confirm that the salary mentioned above is about right. Little more can be expected by a technical engineer. Certainly not more than one man in every hundred can hope to attain to £600 per annum, and probably not more than one in 500 ever reaches £1,000 per annum. Even then, these highly paid posts are rarely held by the men who deserve them from a technical point of view. Far too often it is a case of being a member of the same golf club as "Somebody"—or marrying a cousin of "Somebody's" wife.

Mr. Gater further puts a delicate finger on a very hot spot when he says: "A large proportion of the more remunerative openings for which a good technical knowledge and suitable personal qualities are essential occur in connection with the sales sides of the industry." He refrains from saying that the large majority of such posts are held by men who, from a technical point of view, are babes in arms who have to be carried over even the simple problems of Ohm's Law—and, moreover, they receive better salaries than men who have sweated blood for years in endeavouring to attain technical knowledge. Presumably, therefore, social qualities, the gift of glib speech, and that elusive quantity, personality, are of more value than much learning. At the end of it all I ask: "Does the electrical industry pay?" And I answer myself: "That it pays salaries, which in years to come will be looked on with abhorrence equal to that with which we now view the sweated labour evils of 20 to 30 years ago."

P. M.

September 11th, 1928.

Electrical Slogans.

With reference to Mr. C. Turnbull's article on "Electric Slogans" in your issue of the 7th inst., it would, I think, be very interesting to have other suggestions on "slogans" from those who recognise the necessity for these.

My suggestion for a slogan would be: "Do it by electricity," or "Let electricity do it."

W. C. Jeary,

Sales Manager, L. G. HAWKINS & CO., LTD.

London, *September 13th*, 1928.

With reference to the correspondence relating to slogans for the advertising of electricity, I quite agree with Mr. Payn's letter, published in your issue of the 14th inst., in which he advocates the adoption of an accepted slogan by the E.D.A., which has the machinery to spread the slogan all over the country. I cannot see, however, how we are to omit the word "electricity" from our slogan. Mr. Payn instances "Worth a Guinea a Box" and "Every Picture Tells a Story" as slogans not containing the name of the commodity, but it should be pointed out that nobody would know what commodity was worth a guinea a box or what relieved the pain indicated by "Every Picture Tells a Story" unless the name of the article always accompanied the slogan, as it does. We are selling something which gives results, but is not sold in boxes or bottles, and it is absolutely necessary to state what the article is we wish to sell. This can only be done by including it in our slogan.

Here are six slogans which I submit with all modesty: *Electricity—Felicity. Switch, no Hitch. Electricity—No Doubt About It. Live Electrically. "Go" by Electricity. Electricity Spells Triumph.*

The E.D.A.'s cheque I will acknowledge with thanks when I get it.

Sidney Geo. Budd.

London, *September 15th*, 1928.

By all means "Sloganise" electrical advertising, but don't let the advertising encourage the "twin flex contractor"—he is sure to get some benefit from it. Therefore, you must make a series of booklets that specifically denounce this class of work from a safety point of view, and let them be broadcast through all good-class contractors.

I would suggest a few slogans as follows:—

Electricity—For Service and Safety.
There's Satisfaction in Safety—Use Electricity.
Electricity—Convenience and Comfort.
Electricity—Clean! and Complete in Service.
Economy—Efficiency—Electricity.
Where there's a Switch—There's a way.

James Scott.

London, *September 15th*, 1928.

If the electrical industry were not so firmly wedded to the word "electricity," probably many of the difficulties with regard to suitable slogans would disappear. The use of the word "electrically" in place of "electricity" simplifies the problem considerably.

A well-known advertisement says:—

"Sew by electricity."

Consider: "*Sew* electrically and *so* effectually."

As a useful slogan I would suggest:—

"Do more electrically."
"Do more. Electrically."
"Do more electrically and so do more."

Or the following:

Do More. *Electrically.*
Sew—but sew electrically.
Cook—but cook electrically.
Wash—but wash electrically.
Sweep—but sweep electrically
And
So—do more effectually
By—doing all electrically.
Do more *electrically.*

In fact, "To count your chickens before they are hatched," "Incubate electrically."

Every message that induces the public to "think electrically" helps the industry as a whole.

What we want to do is to—

"Think electrically and think more, electrically."
"See electrically and see more, electrically."
"Talk more, electrically,"

and induce others to do the same. What the public wants in electrical matters is more light electrically. Obviously—Electric Light.

Advertise: "Say it electrically."
To reap rich harvests, "Sow electrically."
Do more and more electrically—and so on, *ad infinitum.*

(Mrs.) M. L. Matthews.

London, *September 14th*, 1928.

"Lineman" is asked to send us, in confidence, his name and address.—EDS. ELEC. REV.

Earth or Insulate?

The article on "Earth or Insulate," concluded in the current issue of the ELECTRICAL REVIEW, provides much food for thought at the present time. Without going into any of the main points of the article, there is one paragraph which to me is rather startling, *viz.*: "Try and earth the average hair dryer or small electric fan, and they will pass out within a week. In fact, I believe a lot of these articles are sold with leakage to frame already in existence; any attempt at universal earthing will effectively stop the sale and deprive the public of these useful articles."

This is a very sweeping statement, and in fairness to the manufacturers of small motor-driven appliances, I consider it is quite unjustified. Some ten years' experience in the manufacture and use of fractional-horse-power motors for all purposes has convinced me that practically all small motors, British and foreign, are as robust as regards insulation as larger plant.

Certainly with the firms with which I have been connected I have never seen or heard of any motors being passed "with a leakage to frame already in existence" or anything near it, the general conditions of test being one thousand volts and one megohm, or reject.

I should imagine that either your contributor has been misinformed or he has struck a particularly bad batch of machines of doubtful make. In any case, I do not see that the public would be deprived of those appliances if universal earthing were adopted. If appliances *are* failing at present, due to poor insulation, it is only up to the manufacturers to look to this point. There are certainly no serious technical difficulties in the way of soundly insulating these small motors, as seems to be implied in the article.

Stuart F. Philpott.

Swindon, *September 17th*, 1928.

Electricity and the Daily Press.

With reference to your leaderette, "Another Libel on Electricity" regarding a newspaper report of a death by blood-poisoning caused by an electric iron, the daily Press at large are always ready to label accidents and fires as caused by electricity; but it would be as well for them to remember that electricity is an ever-ready servant to them, for without its help the production of their papers would be impossible.

F. Goble.

London, *September 17th*, 1928.

Published Specifications.

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specification will be printed and abridged and all subsequent proceedings will be taken.

1927.

5,164. "Overload circuit-breakers." Voigt & Haeffner Akt.-Ges. February 23rd, 1926. (266,728.)

7,457. "Wireless transmission and reception." J. Robinson. March 17th, 1927. (295,957.)

10,679. "Apparatus for controlling and regulating the speed of machines." Lancashire Dynamo & Motor Co., Ltd., R. S. McLeod, and H. W. Bosworth. April 21st, 1927. (295,958.)

11,584. "Magnetic alloys." W. S. Smith, H. J. Garnett, and J. A. Holden. April 30th, 1927 (296 137.)

13,661. "Electric switches." J. H. Tucker & Co., Ltd., and T. R. Martin. May 21st, 1927. (295,965.)

13,696. "Electric fuses." A. Reyrolle & Co., Ltd., and F. Coates. May 21st, 1927. (295,968.)

13,942. "Electric draw-out switchgear." British Thomson-Houston Co., Ltd., and W. P. Hamlyn. May 24th, 1927. (296,113.)

13,955. "Method of increasing the efficiency of electrical conductors." B. Gati. February 17th, 1927. (285,447.)

13,992. "Automatic or semi-automatic telephone systems." Standard Telephones & Cables, Ltd. (G. Deakin and L. Polinkowsky). May 24th, 1927. (296,044.)

14,007. "Electric cables." W. E. Beatty (Bell Telephone Laboratories, Inc.). May 25th, 1927. (296,114.)

14,189. "Speed regulation of asynchronous motors." C. Shenfer and English Electric Co., Ltd. May 26th, 1927. (296,123.)

14,213. "Kerr cells and control means therefor, particularly applicable to picture telegraphy." G. M. Wright. May 26th, 1927 (296,124.)

14,293. "Cable telegraphy." W. E. Beatty (Bell Telephone Laboratories, Inc.). May 27th, 1927 (296,131.)

14,539. "Multiple electrical conductor for radio apparatus." E. T. Flewelling. August 10th, 1926. (275,938.)

14,761 "Direct-current electric regenerative braking systems." W. D. Sheers, A. Tustin, and Metropolitan-Vickers Electrical Co., Ltd. June 1st, 1927. (296,140.)

14,826. "Electric contact-making devices." O. Nagy. June 15th, 1926. Addition to 247,961. (272,943.)

15,194. "Thermionic valves." Telefunken Ges. Fur Drahtlose Telegraphie. June 4th, 1926 (272 249.)

16,230. "Electrically-wound timepieces." English Clock & Watch Manufacturers, Ltd., and P. N. Walford. June 18th, 1927. (296,150.)

16,561. "Electric iron conductor support." J. Jerike. June 26th, 1926. (273,304.)

17,427. "Gas-treating devices for enclosed electrical apparatus." A. G. Ellis and Metropolitan-Vickers Electrical Co., Ltd June 30th, 1927. (296,160.)

18,291. "Electrical heating device for warming beds, plates, and the like." A. Imbery and L. F. Whitehouse. July 9th, 1927. (296,166.)

18,433. "Spark plugs for internal combustion engines." H. Schlaich. April 30th, 1927. (289,758.)

18,531. "Apparatus for high-frequency electric signalling." W. J. Brown and Metropolitan Vickers Electrical Co., Ltd. July 12th, 1927. (296,169.)

18,604. "Connecting of circuits in telephone systems." Siemens Bros. and Co., Ltd., and W. H. Grinsted. July 15th, 1927. (296,170.)

19,195. "Control of electric circuits on vehicles." Etablissements E. Jaeger. August 9th, 1926. (275 593.)

19,931. "Electric motor control." British Thomson-Houston Co., Ltd., and L. R. Nixon. July 27th, 1927. (296,179.)

19,946. "Electric lampholders, adaptors, and the like." W. V. Butterfield, A. W. Butterfield, and S. Butterfield (trading as Mycronet Manufacturing Co.). July 27th, 1927. (296,180.)

19,978. "Electrical reset driving devices for clocks and other mechanism." T. Mercer and F. Mercer (trading as T. & F. Mercer). July 27th, 1927. (296,181.)

20,122. "Electic battery cells" H. Kohne and W. Suhrcke. July 28th, 1927. (296,184.)

20,700. "Telephotography and television." B. Schildenfeld. August 10th, 1926. (275,976.)

21,889. "Device for the electric distant transmission of angular speeds." E. Granat and Compagnie des Forges et Aciéries de la Marine et d'Homecourt. March 19th, 1927 (287 441.)

22,654. "Electric switches." H. Careis. August 31st, 1926. (276,933.)

22,784. "Electric signalling installations." Siemens & Halske Akt.-Ges. January 21st, 1927. Addition to 280,503. (283,944.)

23,887. "Gallery fittings for electric lamps." J. Coggins and J. McLean. September 12th, 1927 (296,199.)

25,133. "Electric annealing resistance furnaces." Akt.-Ges. Brown, Boveri et Cie. September 30th, 1926. (278,892.)

25,311. "Electric iron conductor support." J. Jerike. December 23rd, 1926. Addition to 273,304 (282,630.)

25,333. "Producing metals in electric furnaces." E. G. T. Gustafsson. September 27th. 1926. (278,000.)

25,510. "Magneto-electric machines." C. Olivetti & Co. September 27th, 1926. (278,022.)

25,738. "Electro-magnetic sound reproducing and recording devices." C. Berrage-Mouron. September 29th, 1927. (296 297.)

26,101. "Protective arrangements for electric distributing systems." S. G. S. Dicker (Union d'Electricité). October 3rd, 1927. (296,210).

28,999. "Means for recording indications at a distance electrically." British Thomson-Houston Co., Ltd. November 24th 1926. (280,800.)

29,128. "Means for synchronising alternating-current electric circuits." British Thomson-Houston Co., Ltd. November 24th, 1926. (281,242.)

30,079. "Arc welding" M. Zack. November 9th, 1926. (280,538.)

31,080. "Windings for electrical apparatus." British Thomson-Houston Co., Ltd. November 18th, 1926. (280,951.)

34,607. "Electric motor control." British Thomson-Houston Co., Ltd. December 23rd, 1926. (282,689.)

1928.

808. "Electric switches." J. Sax & Co., Ltd., and J. E. Abbott. January 10th, 1928. (296,240.)

1,001. "Electric fuses for projectiles." Rheinische Metallwaaren-und Maschinenfabrik. January 14th, 1927 (283,585.)

1,144. "Party-line telephone systems." Hasler Akt.-Ges. vorm. Telegraphen-Werkstatte von G. Hasler. February 14th, 1927. (285,364.)

4,892. "Machines for melting off the superfluous parts of glass bulbs." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 10th, 1927. (287,131.)

8,332. "Gasfilled electric incandescent lamps." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 25th, 1927. (287,563.)

8,382. "Electric mining lamps." Concordia Elektrizitats Akt.-Ges. and W. Gosmann. March 19th, 1928. (296,277.)

8,464. "Ventilation of dynamo-electric machines." British Thomson-Houston Co., Ltd. March 22nd, 1927. (287,504.)

12,415. "Gasfilled electric incandescent lamps." General Electric Co., Ltd. April 28th 1927. Addition to 260,916. (289,489.)

12,605. "Electrically heated devices for baking, frying, cooking, and the like." B. Hanyzer. April 30th, 1928. (296,289.)

12,801. "Manufacture of electric incandescent lamps." General Electric Co., Ltd. May 17th, 1927. (290,610.)

13,206. "Cable leading-out piece for pupin coil-boxes." Siemens-Schuckert-werke Akt.-Ges. June 20th, 1927. (292,994.)

15,372. "Temperature-indicating systems for dynamo-electric machines." Metropolitan-Vickers Electrical Co., Ltd. June 4th, 1927. (291,448.)

19,662. "Telephone cable for working with four wires." Siemens-Schuckert-werke Akt.-Ges. July 26th, 1927. (294,570.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from September 12th:—

Limit. No. 490,180. All goods in Class 8.—Limit Engineering Co., Ltd., 17, Albion Street, King's Cross, N.1

Diktator (lettering and design). No. 491,857. All goods in Class 8.—Parlophone Co., Ltd., 1, Broad Street Place, E.C.2.

Robot. No. 492,274. Class 8. Radio-telephonic apparatus, &c.—T. Large, 6, Irby Avenue, Eric Road, Wallasey.

Clix. No. 492,399. All goods in Class 8.—Lectro Linx, Ltd., 254, Vauxhall Bridge Road, S.W.1.

Triflector. No. 492,527. All goods in Class 13.—Benjamin Electric, Ltd., Tariff Road, Tottenham, N.17.

CORRECTION.—An error occurred in connection with the Benjamin Electric, Ltd., trade mark, No. 492,528, Class 15, in our last issue. It is "Triflector," and not as printed.

The I.E.E. Benevolent Fund.

The first golf match held in connection with the Benevolent Fund Cup recently presented to the Scottish Centre of the Institution of Electrical Engineers, took place on Tuesday, September 11th, at the East Renfrewshire course. Sunshine favoured the outing, which was much enjoyed by those present. The trophy was won by Mr. H. W. Bewsher with a score of 2 up on bogey, Mr. W. Sutcliffe being the runner-up with 3 down on bogey.

Mr. D. M. Macleod, chairman of the Scottish Centre, in making the presentation, expressed the hope that the cup, kindly given by Messrs. W. Winning and A. Hutcheson, would year by year increasingly aid the Benevolent Fund.

This being the final social meeting of the Centre for the present session, Mr. J. Campbell Murray was awarded a vote of special thanks as convener of the Entertainments Committee, for the efficient way in which he had carried out the duties during a very arduous year.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ABERDEEN.—Extension of commercial quay (£5,000); Mr. R. Gordon Nicol, C.E., harbour engineer.

ACCRINGTON.—Houses (49), for the T.C.; Garbutt & England, builders, Cudworth, Barnsley.

ALVASTON (DERBYSHIRE).—Houses (50), for T. Holt & Son.

AYLESHAM (DOVER).—Central school for Kent Education Committee; W. H. Robinson, education architect, Sessions House, Maidstone (returnable deposit of £2 2s.).

BARNSLEY.—50 houses, Burton Grange; C. D. Potter & Sons. 100 houses, Burton Grange; W. Dunk & Sons.

BAWTRY (DONCASTER).—Post office, for H.M. Office of Works, King Charles Street, London, S.W.

BENHAR.—School (£15,000), for Lanarkshire E.C.; director of education, Hamilton.

BIRKENHEAD.—Addition, The Institute, Brassey Street; Institute Committee. Reconstruction of premises, corner of Hamilton Street and Library Street; Mr. A. E. Shennan, for Westminster Bank, Ltd. Catholic church, Flaybrick Hill; Rev. Canon Rooney. Houses, Crutchley Avenue; Dawson Birkenhead Houses, Ltd.

BRISTOL.—Re-erection of Red Hill leather works, St. George, for David Hodges (£5,000). 75 houses, Longmead Avenue, Horfield; Northville Building Co. Extensions, Frenchay Park Sanatorium (£28,450); Coles Bros, Ltd., Bath. 420 houses, Horfield Estate, and 30 houses, Shirehampton Estate; city engineer.

BURNSIDE.—School (£14,500), for Lanarkshire E.C.; director of education, Hamilton.

BURTON-ON-TRENT.—Market site development, High Street (£4,500); borough engineer and market superintendent.

CAMBORNE (CORNWALL).—Housing scheme (50), for the U.D.C.; surveyor.

CANNOCK.—Nurses' home (£6,500), for the B.G.; Mr. Wormall, architect.

CARLISLE.—Estate development for McInnes trustees, Rickerby; Mr. W. P. Gibbings, architect.

COLMONELL (AYRSHIRE).—Grain mill Jane Street, for R. M'Farlane, Colliery Mill, Ballantrae.

COVENTRY.—Church and Sunday schools, Little Bayton, for the Primitive Methodist Second Circuit trustees; secretary.

CREWE.—Additional 150 houses for the T.C.; borough surveyor.

DAGENHAM.—Works, for H. Hunt, Concrete Products, Ltd. Business premises and showrooms for Grays Co-operative Society, Ltd.; secretary.

DOUGLAS (I.O.M.).—Warehouse, South Quay; Corlett, Sons and Cowley, Ltd.

DOVER.—Cinema, for the Plaza Picture Palace Co.; A. H. Steele, architect.

DRIFFIELD.—Re-erection (after fire) of central block, Isolation Hospital, for East Riding C.C.; clerk, Beverley (£8,000).

DUDLEY.—Shop and flats, High Street; Provincial Picture Houses, Ltd. Extensions, Dye Works, New Town; A. and M. Hill. Extensions, Guest Hospital (£50,000), for the Management Committee; secretary.

DUKINFIELD (CHESHIRE).—Additional 50 houses for the T.C.; borough surveyor.

EDINBURGH.—Research department (£30,000) for the University of Edinburgh, West Mains Road. Telephone exchange, Portobello, for H.M. Office of Works, King Charles Street, London, S.W. New demonstration school for the Provincial Committee for the Training of Teachers (£40,000); principal, Training College, Canongate.

EXETER.—Extensions to county offices (£50,000), for Devon C.C.; county architect.

FAVERSHAM.—Bottling premises, for George Beer & Rigden, brewers.

FRINTON-ON-SEA.—Parish church (£28,000); Rev. J. V. S. Bird, rector.

GLASGOW.—Schools at Springfield Road and Elba Lane for Education Authority; master of works, Path Street. 138 blocks of houses for the Western Heritable Investment Co.; the secretary. New Mosspark Congregational church; trustees.

HASTINGS.—New St. Saviour's Church, St. Leonards; J. B. Mendham, architect, 17, Dartmouth Street, Queen Anne's Gate, London, S.W. 20 houses, Elphinstone Avenue; Mr. J. B. Ward.

HARROGATE.—Additions at the Infirmary (£5,000); Local Branch National Council of Women.

HEBDEN BRIDGE (YORKS.).—New St. John's Church (£7,000); vicar.

HENLEY-ON-THAMES.—Pumping plant (sewerage works) and refuse destructor (£11,182), for the T.C.; A. Caldecott, clerk.

HOUGHTON-LE-SPRING (CO. DURHAM).—Additional 40 houses for the R.D.C.; surveyor.

KIRKINTILLOCH.—Conversion of Mansion House into public library (£1,000); Mr. Patrick, town clerk.

LEEDS.—Municipal offices, Market Buildings; city engineer.

LEYBURN (YORKS.).—Development of Risebar Estate for houses, Wetherill & Dent, architects, Darlington.

LITTLE IRCHESTER (WELLINGBOROUGH). — Rebuilding Prince of Wales Inn, for Chas. Wells & Co., Ltd., brewers.

LITTLE SUTTON (LINCS.).—Housing scheme (18) for East Elloe R.D.C.; S. S. Mossop, jun., clerk, Holbeach.

LONDON (ROMFORD, E.).—Recreation room, police station (£2,000), for Essex C.C.; J. Stuart, county architect, Chelmsford.

(CRICKLEWOOD, N.W.).—Alterations, 127, Broadway; Freeman, Hardy & Willis, Ltd.

(WILLESDEN, N.W.).—15 flats, Sidmouth Road; George Ball (Willesden), Ltd. 97 houses, Newcombe Estate; Mr. W. Beck.

(CATFORD, S.E.).—Estate development, near Southend Lane; A. J. Glock, Ltd.

(FOREST HILL, S.E.).—Cinema, London Road; Douglas Halse and Co., Ltd.

(LEWISHAM, S.E.).—Rebuilding 102-4, High Street; Mr. S. Clough. Additions Bell public-house, Bell Green; Mr. Noel Parr. 20 houses, Danevy Road; Mr. A. E. Thomas. 226 houses, L.C.C. Downham Estate; Mr. J. C. Stephenson. Town hall, shops, &c., for Borough Council; Messrs. Bradshaw, Gass & Hope, architects.

(PENGE, S.E.).—Secondary school for boys for Kent E.C.; W. H. Robinson, education architect, Sessions House, Maidstone (returnable deposit of £2 2s.).

(SYDENHAM, S.E.).—Rebuilding Rink Cinema, Silverdale; Mr. W. E. Challis, for Provincial Cinematograph Theatres, Ltd.

LUTON.—Factory extensions, Reginald Street, for the Reginald Hat Manufacturing Co., Ltd.

MAIDSTONE.—Extensions, Kent County Ophthalmic and Aural Hospital, for the Board of Management (£15,000); secretary.

MOTHERWELL.—Extensions, Dalziel Secondary School (£7,500), for Lanarkshire E.C.; director of education, Hamilton.

NELSON (LANCS.).—New St. Bede's Church (£7,000); incumbent.

NORTHAMPTON.—Housing scheme (46), St. David's Estate, for the T.C.; Alfred Fuller, borough engineer (returnable deposit of £5).

OLDHAM.—Alterations, White Hart Inn, Hollins Road; Oldham Brewery Co., Ltd. Alterations, Royal Oak, Rhodes Bank; F. Robinson, Ltd. Extensions, Mill, Glodwick Road; Lees & Wrigley, Ltd.

POULTON-LE-FYLDE.—Joseph Cross Memorial Convalescent Home; John B. Thornley, architect, Darwen; James Byrom, builder, Bury, Lancs.

RAMSGATE.—Housing scheme (20), for the T.C.; T. G. Taylor, borough engineer, 16, Albion Place.

REMENHAM (HENLEY-ON-THAMES).—Electric light installation, church and parish hall, for the Parochial Church Council; Rev. S. C. Rees-Jones, rector.

ROMILEY (CHESHIRE).—Housing scheme (36), Cherry Tree Estate, Compstall Road (deposit £1 1s.); Thorpe and Collier, architects, 66a, Deansgate, Manchester.

ST. HELENS (LANCS.).—School, concert hall and recreation room, Eccleston Hall Sanatorium, for the T.C.; A. W. Bradley, borough engineer (returnable deposit of £1 1s.).

SALFORD.—School (450 places), Tootal Drive, Pendleton, for the Borough E.C.; director of education.

SPALDING.—Housing scheme (20), for the U.D.C.; surveyor.

STALYBRIDGE.—Pavilion, Quarry Street Mills; Robert Platt, Ltd. Dwellings, corner Buckton Vale Road and Huddersfield Road; borough engineer.

SUNDERLAND.—Block of 75 flats, for the T.C.; borough surveyor.

SWANAGE.—Housing scheme (30), for the U.D.C.; F. Camble, surveyor.